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Issue 3/2022

K-PROFI

international edition

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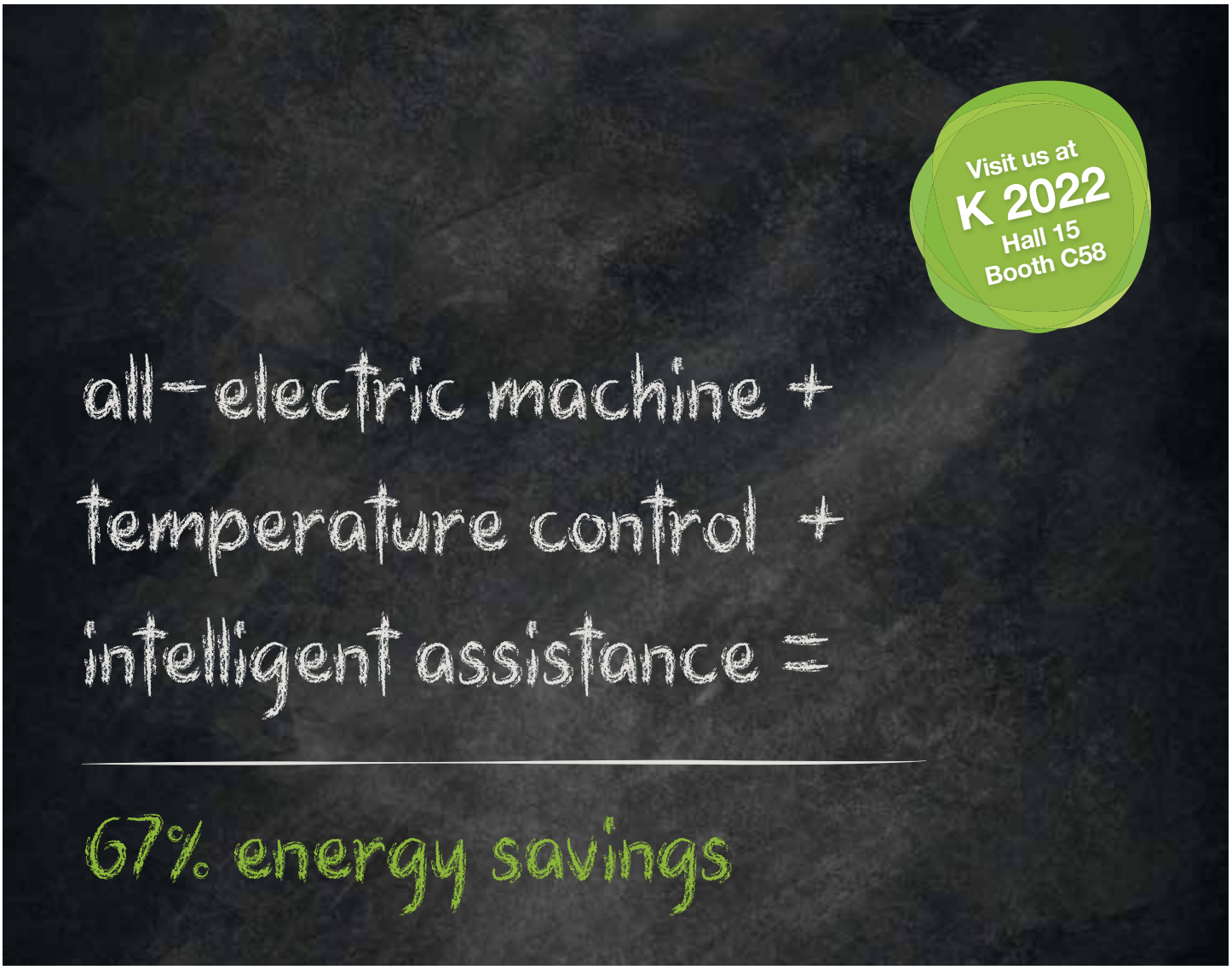
Detailed trend report: How the DKT trade fair inspired rubber experts.

Michael Trapp explains why through-coloured compounds can be superior in niche applications and why it is irrelevant whether he uses secondary raw materials to do so

"Quality instead of quota"

How **Brüderle** profits from China failure and garden boom. How the thermoformer **Swissplast** is conquering XXL 3D printing. What goals **Greiner Packaging** is setting itself. How **Sortco** protects compounders from complaints. And how **Sirmax** is striving towards bio- and re-compounds.



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In focus: security of supply and sustainability

Dear reader

security of supply, mobility change and sustainability are in the media and political spotlight. The rubber industry is also facing up to the challenges. The energy transition is pushing the cable industry. With e-mobility, power lines and renewable energy sources, nothing works without cables. This was impressively confirmed at the Düsseldorf „Wire" trade fair: Page 6. "We protect raw material and compound manufacturers from complaints," says Lars Ruttmann and helps to minimise rejects and act sustainably with the sorting service provider Sortco: Page 12. What the rubber experts got to see in terms of new materials, machines and processes at the „DKT" congress fair in Nuremberg can be read from page 17 onwards.

The Aachen-based start-up B.IRD wants to establish infrared drying of pellets directly at the compounding extruder or injection moulding machine. It is supposed to work faster and more efficiently than conventional central drying: page 36. As a contract injection moulder, Brüderle Kunststofftechnik profited from Corona-related China failures and booming gardening demand. Peter Brüderle and his son Pierre explain why starting on page 38. The Italian Sirmax Group wants to increase the share of bio- and recyclate-based compounds in its portfolio from 10 % to 25 % by 2025. Leonardo Forner explains why the 260,000 t compounder has ordered six new German extruders: page 44.

How does Greiner Packaging manage the balancing act between sustainability and consumption? CEO Manfred Stanek sees the onus above all on the distributors and spoke about the goals of the packaging manufacturer: page 49. Michael Trapp from Sattler KunststoffWerk explains why through-dyed compounds can be superior in niche applications and why product quality is guaranteed at virgin material level when secondary raw materials are used: page 52. The thermoformer

Swissplast Group conquers XXL 3D printing and uses it to build large tools, large components and fixtures in Ichenhausen: page 56.

My team and I wish you useful impulses as you turn the pages and read.

Markus Lüling, Editor-in-chief
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In this magazine

Cover photo: K-PROFI/Hauptmann

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Energy and transport shifts boost cable industry

Düsseldorf trade fair wire closes with satisfied faces, international visitors, and a positive conclusion

"We wire the world sustainably" – this slogan on the exhibition stand of Gutmann Aluminium Draht GmbH from Weissenburg is also the trade fair motto of wire 2022, which was held this year at the same time as the Tube. Sustainability is the number one core topic at each of the wire trade fair stands visited by K-PROFI. Materials, machines, energy management, but also cafeterias, employee commitment and recruiting of junior staff receive the sustainability seal here. Sustainability has a whole other meaning in the cable industry. After all, the worldwide goals for sustainable solutions cannot be realised without cables. Whether it's the energy transition, e-mobility, the German North-South energy supply route, the electrification of wind turbines or other renewable energies, nothing works without cables. The industry is booming and happy about the strong order situation.

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

"Germany is one of the leading countries when it comes to the energy transition. Here, the north-south route is currently being built to transmit energy in the form of direct current over around 800 km from offshore wind farms in the North Sea to southern Germany," explains Bart Verheule, Global Commercial Director at Borealis. For the so-called German corridor, of course, appropriate underground cables are needed which, on the one hand, can transmit this enormous power at 525 kV in the first place and, on the other hand, are so reliable that they can easily spend their service life of more than 40 years underground without defects. It is only logical that the high-voltage cables, which weigh about 80 kg/m and have a diameter of about 15 cm, are laid as underground cables. Other grids in Europe are also increasingly being built with underground cables, even though overhead cables are cheaper to route, as Dr. Krischan Jeltsch from Buss AG in Pratteln, Switzerland, reports. Overhead cables are therefore still predominant, especially in earthquake regions and in less populated countries such as the USA, Thailand, and Japan. It is also obvious that overhead cables

All photos: K-PROFI

are much easier to reach when they need to be repaired. This is one reason why the highest quality is essential for underground cables, and the polymer used to protect the inner strand of wire is definitely the primary factor in this regard. The plastic of choice for underground cables is a cross-linkable polyethylene (XLPE). Borealis has been offering this under the name Borlink for many years and, according to Bart Verheule, is one of the main suppliers for the cable manufacturers involved in the energy route.

Sustainable material solutions

With the XLPE compound HFDD 4201, Dow presented a new member of its Endurance product family at the wire, which is also precisely tailored to the application of high energy transmission rates. "The highlight of our new product is that it requires around 80% less degassing time, which gives processors a huge time and cost advantage while reducing greenhouse gas emissions," reports Julia Schlenz, European Senior Sales Director for Infrastructure, Consumer and Transportation at Dow.

A sustainable solution related to the production of XLPE grades was presented by Buss AG at the fair. "We are currently setting up a new production plant with Repsol to manufacture the cross-linkable PE materials, which does not require any soaking/absorption towers for the peroxide at all," Dr Krischan Jeltsch presented. Conventionally, XLPE cable compounds are produced in a process that requires the so-called soaking tower after polymer production, in which the active peroxide that ensures cross-linking during processing is diffused into PE and stabilised so that cross-linking only occurs at the right moment. "The new LSHC process (Linear Short Hyper Clean), which we developed together with the patent applicant P&M Cable Consulting LLC, is based on our Compeo Kneader and produces high-purity XLPE," Dr Jeltsch continues. The main advantage of the process, he said, besides the enormous purity of the cable compounds, which is essential for transmitting high amounts of energy, is the time and cost savings. "Our process is very fast and powerful and needs significantly less investment, operating and energy costs."

Securing sustainable applications

In addition to energy transmission via the German corridor, alternative energy generation, for example in the form of photovoltaic and wind power plants, as well as electrically powered vehicles, are the main applications that the exhibiting companies at the wire want to serve with their specific solutions. Safety is of course a major issue in this context. The plastic materials used must be of high purity to rule out defects and prevent short circuits. To ensure this, online and offline inspection, sorting, and analysis systems are offered on the market.

It is not uncommon for cable manufacturers to use online inspection systems upstream of the extrusion line to eject defective plastic

From top left to bottom right:

Dr Krischan Jeltsch from Buss: "Metal impurities in the plastic insulation of cables are the killer; after all, they have to insulate. Our new process ensures high-purity materials."

Bart Verheule of Borealis: "Cables not only ensure sustainability, they themselves are also sustainable, after all they are long-term products that usually last longer than 40 years."

Julia Schlenz of Dow: "Acting sustainably also means fostering young talent, which we urgently need in the growth market of cables."

Oliver Kraushaar of OCS: "Demand for the use of PCR materials is also increasing in cable applications."

Roger Möller of Maillefer: "To detect surface defects in submarine cables at an early stage, we have developed a laser-based monitoring system for the extrusion lines."

Eva Gotor of Deltacolor: "Especially in vehicles, where more and more data is being recorded and transmitted today, the cables are exposed to high temperatures. We respond to this with tailor-made additives."

particles directly. Besides the safety aspect, such systems ensure high production efficiency and low waste. Another contribution to more sustainability. Pellet scanners are offered, for example, by OCS Optical Control Systems GmbH from Witten, which exhibited at wire for the first time this year. "Our systems work with two 3-CMOS colour cameras that monitor the pellets from two perspectives and eject bad material directly. In this process, they find defects that are 25 µm in size at throughputs of up to 1,000 kg/h," presents Sales & Project Manager Oliver Kraushaar from OCS.

Sikora AG from Bremen also offers online systems for monitoring granulate quality and, depending on the task, uses up to three cameras for three perspectives as well as an additional X-ray camera on request, so that not only the smallest optical contaminations from 25 µm but also metal inclusions in the granulate can be detected. Of course, the quality of the produced cable is also important and for this purpose Sikora presented its X-ray measuring system X-RAY 8000 Advanced at the fair, which monitors wall thickness, eccentricity, diameter and ovality of cables with up to three different material layers. By

combining the X-ray device with the Ecocontrol 6000 processor system, the wall thickness could even be automatically controlled to the minimum value, which in turn would save raw material. "We already have about 1,800 X-ray systems on the market today, and demand remains high," reports Sikora's Head of Sales Wire & Cable Aguinaldo Ramalho. Many enquiries come from China in particular. He also reports that, due to the long delivery times, some customers are already buying a monitoring system before they even have the right cable extrusion line.

Safety as another key issue

In addition to sustainability, safety is an important topic at the fair. Woywod Kunststoffmaschinen GmbH & Co. Vertriebs-KG from Gräfelfing, Germany, for example, presented self-cleaning metering systems that ensure that contamination by foreign materials does not occur during a product changeover, and Delta Tecnic SA from Sant Celoni, Spain, presented "safe" masterbatches. "Even after many years, the colours of the individual cables of a wiring harness in a car must still be precisely distinguishable," said Marketing Manager Eva Gotor, giving an example of what is important for masterbatches for the cable industry. Especially in light of the fact that a wiring harness in an automobile today contains about 6 m of cable, about twice as much cable as a few years ago, the correct classification is very important.

The same applies to the property profile of the polymers, which must not change, especially in the application and at the high temperatures. Safety is also provided by the correct label on a cable, which allows it to be clearly identified. Bart Verheule of Borealis says: "We succeed in laser printing the ever-thinner fibre optic cables for clear identification." This is safe, but also sustainable, as ink is no longer needed. Safety is also an important issue for Borealis in connection with the additives used: "According to the REACH regulation, azodicarbonamides, which have so far been used as blowing agents for cable materials, are to be banned. Therefore, we are already using alternative blowing agents today," says Verheule.

Delivery times hamper growth market

"The market volume for high-voltage and extra-high-voltage cables will increase fourfold in the coming years," Roger Möller, Vice President Services at Maillefer Extrusion Oy from Vantaa, Finland, is certain. The demand for high-performance extrusion lines for cable production is therefore already very high. Maillefer specialises in systems in which the cable is extruded vertically to prevent sagging. "Unfortunately, however, we cannot supply our customers promptly. Delivery times of 14 to 18 months are quite common, but we are striving to improve this." The main problem with the high demand, he says, is the lack of electronic components in addition to steel procurement. This is also confirmed by Jürgen Gress, Director Sales Administration and Controlling at Maschinenfabrik Niehoff GmbH & Co. KG from Schwabach. The manufacturer of machines for the production of wires made of non-ferrous metals and further processing into automotive, energy, data and special cables often has to put off its customers despite a very good order situation. "The order situation has seldom been better, especially plants for the production of data cables are in great demand during the Corona crisis. However, we are not succeeding in satisfying the enquiries because electronic components are not available." Here, too, delivery times of between 12 and 14 months are quite common, he said.

Aguinaldo Ramalho of Sikora: "By the end of May, we had about 40 % more incoming orders in the Wire & Cable division than originally expected. Here, most of the projects come from the high-voltage cable segment."

Sustainability in all areas

All companies in the cable industry are affected by the long delivery times and the lack of availability. The same applies to the issue of sustainability. For Gutmann Aluminium Draht GmbH from Weissenburg, a German supplier of drawn aluminium round wires, aluminium round rods and profile rods, it is clear that sustainability must be implemented in the entire day-to-day business. Stephan von Galkowski, Quality Management at Gutmann, is certain: "We have to want sustainability." Aluminium in particular, with 6 t of CO_2 emissions during its production, is not a sustainable product, but "we can make it as sustainable as possible." To this end, the company has put all its processes to the test and also involved its employees and suppliers in the process. "We talk to our suppliers and together we think about how we can make aluminium more sustainable, be it by using recycled aluminium or by optimising the supply process," says Stephan von Galkowski, giving an example. He is certain that much more must and will happen in connection with sustainability. And that is exactly what the 1,057 exhibitors at wire from 51 countries and the visitors agreed on. In 2024, wire and Tube will once again be held together from 15 to 19 April.

www.borealisgroup.com
www.busscorp.com
www.deltatecnic.com
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COMMENT

Sustainability starts with everyone themselves!

Sustainability – the topic accompanied my visit to this year's "tube & wire" trade fair in Düsseldorf like no other. Even aluminium processors are thinking about how they can act more sustainably. Great! It seems as if many words are finally being followed by deeds. That pleases me very much as a participant in the industry, but also as a private person. But: on my way across the outdoor area from hall to hall, there are carelessly thrown pizza boxes with leftover pizza and bowls of Asian noodles. Sustainable?

Generating CO_2 to have a pizza or Asian noodles delivered to the fairgrounds, where you can buy food at any place, just throwing the rubbish on the grounds and also throwing away food? Quite exemplary for our society. When the real world looks like this, the professional talks about sustainability in the exhibition halls pale into insignificance. Sustainability starts with everyone, even if that sometimes means eating chips instead of pizza and currywurst instead of Asian noodles or walking a few steps to dispose of rubbish properly. And I don't mean the cleaning team of the trade fair company. *Karin Regel*

Optical defects such as black specks, stippling, burns, greying, yellowing and discolouration can hardly be avoided, but they can be removed.

Lars Ruttmann is sure that the price of sorting is not so decisive when you consider the benefits: "A complaint or a defective component in the wrong place is worse. It's more expensive and damages the image of that particular customer."

"We protect raw material and compound manufacturers from complaints".

Sorting service provider helps minimise rejects and act sustainably

Small mistakes – big effects: A few black granules can turn a white end product into scrap during injection moulding. Not only annoying, but also expensive and unsustainable. Rejects that accumulate at the plastics processor often lead to complaints at the raw material or compound manufacturer. And this is precisely where Sortco GmbH & Co. KG comes into play. "We minimise scrap production at the plastics processor, but our customer is usually the material manufacturer," says Lars Ruttmann. In an on-site conversation at the new location in Niederzissen, the Managing Director explains exactly for whom the granulate sorting service is advantageous, what can be done with it, which machine technology is used and where the limits lie.

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

In fact, black granules contained in a white or transparent raw material batch are only one of many possible contaminations that arrive at Sortco for sorting. After all, any off-colour in a pure colour is an unwanted contamination. "The usual problem we have to deal with here are unavoidable optical defects such as black specks, stippling, burns, greying, yellowing and discolouration, which inevitably occur in any production of plastic pellets – both in virgin material production and compounding," knows Lars Ruttmann, who has been involved with optoelectronic sorting technology for more than 20 years.

And specifically with machine technology. Initially, he distributed sorting systems at Klaus Ruttmann GmbH in Hamburg together with his father before taking over the company solely on his own responsibility in 2011. Since 2015, he has also offered sorting services and expanded them significantly last year with the new location in Niederzissen. And further expansion is already in the pipeline. "We will soon be able to sort up to 50,000 tonnes here at our new location," says a delighted Lars Ruttmann, who has already "cleaned" around 10,000 tonnes with his 17-strong team in the first year. At maximum capacity, Sortco would be able to sort 0.1 % of all 50 million tonnes of plastic granulate consumed annually in Europe.

Worthwhile service for customers

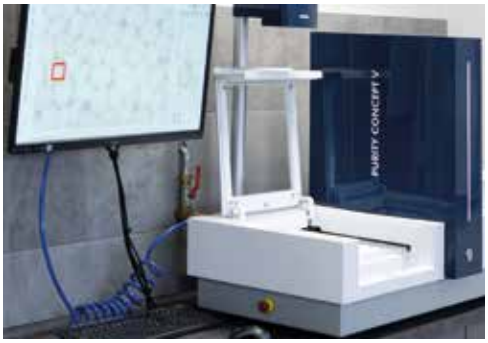
About 50 customers have been using Sortco's service so far, and with a few exceptions these are the manufacturers of the plastic granulates, many of them from the large-scale chemical industry. "We are rarely approached by a plastics processor who wants to be on the safe side with his incoming goods and has them checked by us and cleaned of foreign particles," reports Lars Ruttmann. It is worth doing especially when particularly expensive components are made of high-performance plastics, for example, or when it is a very sensitive application where even the smallest defect can cause major problems. Example: an insulin pump in which foreign inclusions can cause the medication to leak, the pump to dose incorrectly or to fail completely.

Manufacturers of plastic granulates place an order with Sortco for two reasons: either they have discovered during production or in their in-house laboratory that the granulate produced does not meet the required specification, or they want to be absolutely certain that they are selling a product with as little contamination as possible to their customer, the plastics processor. Again, the reasons for this are particularly high-quality and expensive plastics or very sensitive applications with zero-defect tolerance. Finally, there are also damaged goods that are delivered to Niederzissen, but these are rather simple and manageable tasks.

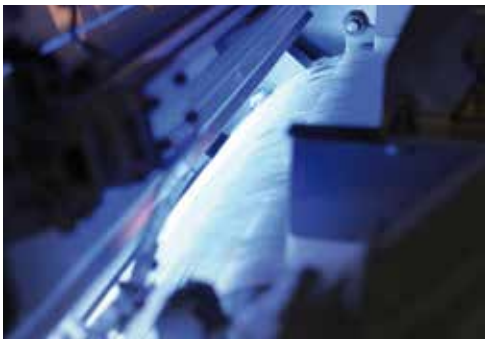
From delivery to the machine

Granulate usually arrives in Niederzissen in the form of a truckload, equivalent to 22 t, which follows the material flow defined for processing. "Generally, we would also sort a small quantity of one tonne, provided the customer is willing to bear the order costs for logistics, administration, testing and cleaning, which are independent of the quantity," explains the Managing Director, who has just had four material silos with a capacity of 70 m³ set up at the site, which provide a high degree of flexibility both for the customers and for Sortco. Material can be collected, stored, and retrieved on demand.

All photos: Sortco



On the light table of Sikora's Purity Concept V, the incoming inspection of each material is carried out based on a sample of about 100 g.



After a maximum of four passes through the camera systems of the sorting equipment, it is certain that only minimal impurities remain in a batch of material.

A sample is first taken from each order to be processed and the contamination level of the incoming goods is determined. 1 kg of plastic granulate consists of about 40,000 individual grains. "Between 20 and 150 defective granules are allowed to be present, no more!" Sortco uses the Purity Concept V from Sikora AG in Bremen for incoming inspection.

About 100 g of granules are spread out on a light table and examined with the help of a colour camera. The system detects black specks and colour deviations from a size of 50 µm and marks them in colour on the monitor image as well as parallel to this via projector on the sample base. In this way, a clear classification can be made, and any contamination can be examined and/or sampled. "At the customer's request, we even collect the contaminations so that they can see them, compare them and analyse them, if necessary," Lars Ruttmann elaborates. After the preliminary examination, the technical manager decides how often and on which equipment the order should be sorted and carries out a test run on the selected equipment. This serves to check whether the contaminants found in the laboratory are reliably detected and discharged. If desired, this can be done in the presence of the customer.

A maximum of four sorting runs

As soon as the technical manager signals "Go", the processing of an order begins on the second level of the production hall with the material feed. Once the granulate has slid down one level, the actual sorting starts with dedusting of the material. Each optical sorting system is preceded by a deduster, and Sortco opted for equipment from Coperion and Pelletron Europe here. "Dust removal is a very important step for us," emphasises Lars Ruttmann. Dust could be detected as defects by the cameras in the sorting systems and influence the sorting result, so it has to be removed beforehand.

Once this is done, the granulate moves to one of the five sorting systems. "We have two plants from Sikora, one from Anysort and two others," the Managing Director continues, explaining that each plant has its own particular advantages. While all operate with two cameras that detect contamination, which in turn is separated via blow-out nozzles, individual ones have anti-wear

The sorting process begins in the production hall in Niederzissen on the second level with the material feed.

On the level below, the actual sorting takes place in a maximum of four passes on one of the five optical sorting systems.

Finally, the cleaned granulate slides down to the ground floor where, after metal separation, it is filled into the container requested by the customer.

equipment for reinforced plastics. The Sikora line is known for its very high blow-out reliability and the new full-colour sorting line from Anysort for its enormous and reliable output of up to 4 t/h, he says. A maximum of four passes makes sense for sorting, Sortco knows from experience. Basically, the motto is "as often as necessary, as rarely as possible", after all, time is money, and the customer has to pay for it. When asked what sorting costs, Lars Ruttmann answers: "The price depends very much on the degree of contamination, the type of contamination itself and the desired result, and can range from a few cents to a few euros per kilogramme." No matter how expensive the sorting is, one thing is certain for Ruttmann: a complaint or a faulty component in the wrong place is more expensive and damages the image of the respective customer.

The most time-consuming part comes at the end

As soon as the granulate has been sorted, another sample is taken to the laboratory to check whether the sorting result has been achieved. In addition, a reserve sample is taken from each sorting run and stored. The granulate finally slides down to the ground floor of the new production hall in Niederzissen and "falls" through one of the five Pulsotronic metal separators before the finished sorted material is filled into the customer's desired container.

In addition to the good material, the customer receives two other fractions back – the optical rejection fraction and the metal rejection fraction. The dust and sweepings that always accumulate are disposed of. "All in all, little is lost in the sorting process and the customer receives the majority of its incoming goods back," emphasises Lars Ruttmann, who makes it clear that any free-flowing granulate, whether in cylindrical, spherical or lenticular form, can be sorted. Difficulties are caused only by dark or reflective incoming goods since the contrast to the defective parts is too low here and thus the detection via camera is impossible. "In any case, transparent, translucent as well as light-coloured plastic particles are easiest to get rid of contaminations." Sortco does not accept hazardous materials under any circumstances.

After the sorting job, a very important and previously very time-consuming step begins for Sortco. "We have to clean all the plant parts used perfectly," explains Lars Ruttmann. At Sortco, cleaning means completely disassembling each plant into its individual parts in order to clean them meticulously. This is done by hand and sometimes takes two shifts, i.e. 14 hours. "Cleaning is immanently important for our work; we have to avoid any external contamination of our incoming goods 100 per cent," emphasises the Managing Director, who is already working on optimisations with his team. "We are in the process of keeping a second set of built-in components in stock for each system, so that we can process the next sorting order much faster by replacing individual components and, while this is running, we can clean the removed components."

Finally, Lars Ruttmann is convinced that sorting requests will tend to increase in the coming years, especially against the backdrop of sustainability and resource scarcity. That is why he has already designed the capacity to 50,000 t/a and would like to double his current sorting output of 10,000 t/a as early as next year.

www.sortco.de

Trade Fair Calender

Trade fairs related to plastics processing in 2022 and 2023

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

Colombiaplas	Bogota, Colombia	26.09. - 30.09.2022	*www.colombiaplast.org*
Powtech	Nuremberg, Germany	27.09. - 29.09.2022	*www.powtech.de*
Fachpack	Nuremberg, Germany	27.09. - 29.09.2022	*www.fachpack.de*
Taipei Plas	Taipei, Taiwan	27.09. - 01.10.2022	*www.taipeiplas.com.tw*
K 2022	Dusseldorf, Germany	19.10. - 26.10.2022	*www.k-online.com*
SPS	Nuremberg, Germany	08.11. - 10.11.2022	*sps.mesago.de*
Compamed	Dusseldorf, Germany	14.11. - 17.11.2022	*www.compamed.de*
Formnext 2022	Frankfurt/Main, Germany	15.11. - 18.11.2022	*www.formnext.de*
Vietnamplas 2022	Ho Chi Minh City, Vietnam	23.11. - 26.11.2022	*www.chanchao.com.tw/vietnamplas*

Swiss Plastics Expo	Lucerne, Switzerland	17.01. - 19.01.2023	*www.swissplastics-expo.ch*
Plast India 2023	New-Delhi, India	01.02. - 05.02.2023	*www.plastindia.org*
KPA	Ulm, Germany	08.03. - 09.03.2023	*www.kpa-messe.de*
ICE/CCE/InPrint	Munich, Germany	14.03. - 16.03.2023	*www.ice-x.com*
Koplas	Goyang-si, South Korea	14.03. - 18.03.2023	*www.koplas.com*
Plastico Brasil	Sao Paulo, Brasil	14.03. - 18.03.2023	*www.plasticobrasil.com.br*
European Coating Show	Nuremberg, Germany	28.03. - 30.03.2023	*www.european-coatings-show.com*
Interpack	Dusseldorf, Germany	04.05. - 10.05.2023	*www.interpack.com*
Plastteknik Nordic	Malmö, Sweden	10.05. - 11.05.2023	*www.plastteknikнordic.com*
Omanplast	Muscat, Oman	29.05. - 31.05.2023	*www.omanplast.net*
Equiplast	Barcelona, Spain	30.05. - 02.06.2023	*www.equiplast.com*
HanoiPlas	Hanoi, Vietnam	08.06. - 11.06.2023	*www.chanchao.com.tw/hanoiplas*
Plastec East	New York, USA	13.06. - 15.06.2023	*www.imengineeringeast.com*
Moulding Expo	Stuttgart, Germany	13.06. - 16.06.2023	*www.moulding-expo.com*
Compounding World Expo	Essen, Germany	14.06. - 15.06.2023	*eu.compoundingworldexpo.com*
Plastics Recycling World Expo	Essen, Germany	14.06. - 15.06.2023	*eu.plasticsrecyclingworldexpo.com*
Plast 2023	Milan, Italy	05.09. - 08.09.2023	*www.plastonline.org*
T-Plas 2023	Bangkok, Thailand	20.09. - 23.09.2023	*www.tplas.com*
Interplas	Birmingham, UK	26.09. - 28.09.2023	*www.interplasuk.com*
Fakuma	Friedrichshafen, Germany	17.10. - 21.10.2023	*www.fakuma-messe.de*
Plast Imagen	Mexico City, Mexico	07.11. - 10.11.2023	*www.plastimagen.com.mx/en*
IPF Japan 2023	Chiba, Japan	28.11. - 02.12.2023	*www.ipfjapan.jp*

Focus on supply security, mobility change and sustainability

How the rubber industry is facing the new challenges

The rubber experts were happy to finally be able to meet and exchange ideas in person again. It hardly mattered that there were fewer visitors than four years ago to the German Rubber Conference (DKT) organised by the German Rubber Society (DKG) in Nuremberg - especially guests from overseas were missing. Those who did come experienced a customarily innovative industry and were able to go home with the feeling that they can rely on the know-how of raw material manufacturers and distributors, machine builders as well as research institutes and service providers to meet the increasing challenges. What there was to see in Nuremberg in terms of interesting innovations in machine technology for rubber processing, you can read from page 22 onwards.

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

A dominant topic in Nuremberg was the availability and price development of important raw materials for rubber processing. Hardly anything is as it used to be. It was reported that processors could not start new production cells that had just been installed because the delivery of the ordered compound took much longer than they were used to. Another had foregone the expansion of its machinery for the time being because it wanted to use the space provided for it as a raw material warehouse as a precaution. These are certainly extremes, but one will have to deal with the fact that many materials are no longer available all the time and at such short notice as they used to be.

Supply chains for carbon black are shifting

Besides gaps in various types of synthetic rubber, there are currently bottlenecks and concerns about carbon black in particular, as Russia and Ukraine are among the major carbon black exporters. "However, we are affected to a lesser extent than some other market participants," says André Wellmann, Junior Sales Manager Luvomaxx at the raw material distributor Lehmann&Voss&Co. Although the Hamburg-based company has discontinued its business with Russia, it had only purchased special types of carbon black from there, such as thermal carbon black. "These are used in the rubber industry mainly for fluororubber applications as well as for seals and container linings," says Wellmann. "The loss of these special carbon blacks is offset by increased demand for our furnace carbon blacks, which we source from China. More than 98 % of the carbon blacks produced worldwide are produced by the furnace process. More than two thirds of this goes to the tyre industry. Large quantities also go into technical rubber articles, such as profiles, hoses or conveyor belts." As far as overall availability is concerned, Dr Jens Stehr, Head of Product Development Luvomaxx at Lehmann&Voss&Co, sees shifts rather than shortfalls in the medium term. "It will level off," Dr Stehr is convinced, "because Russia will find other customers on the world market, which will then free up capacity for buyers who no longer trade with Russian companies." However, he sees a risk in the possible loss of Ukrainian suppliers. One large manufacturer, for example, is located in the city of Kremenchuk, which is repeatedly under attack. Hamburg also must take into account the increased prices on the world market. "While last year there was still a one in front of the decimal point, we have now reached prices well above two euros per kilogramme of carbon black," André Wellmann knows.

Biesterfeld Performance Rubber also sees itself well positioned in the current environment. "In the six years of our existence, we have further expanded the number of our raw material partners so that we are not dependent on individual suppliers," says Managing Director Sascha Hennig. This has also enabled the company to compensate for shortfalls in carbon black deliveries from Russia, Belarus and Ukraine. "Our partner Cabot has supported us well in this." Since the carbon black manufacturer has production sites in the CR, France and Italy, among others, the supply chains are also short and intact.

André Wellmann (l.) and Dr Jens Stehr of Lehmann&Voss&Co. see their carbon black business hardly affected.

Biesterfeld has parted ways with the Russian rubber manufacturer Sibur, from whom it had purchased NBR. "In the meantime, we have been able to win LG Chem as a supplier," says Hennig. Nevertheless, there are currently always gaps and supply bottlenecks in the raw materials needed. "Then flexibility is required," knows Dr Dirk Kilian, who has gained extensive experience with various raw material manufacturers. He now uses this and his worldwide contacts as a technical advisor to support rubber processors in procurement or even in the event of a change in formulation that has become necessary. However, his expertise is not limited to the pure material area, but also to the further processing steps up to the optimisation of processes along the processing chain. On a broader basis, Dr. Kilian cooperates with Rade GmbH, which offers a platform for various supply routes and customer solutions with Rade Rohstoffe.

From the combustion engine to the electric motor

In view of ever more compact combustion engines with ever higher temperatures under the bonnet, special rubbers have been developed in recent decades to withstand such drastic conditions. Ethylene acrylate rubbers (AEM) and special high-temperature grades of acrylate rubber (ACM) are resistant to oil from engines, transmissions, and automatic transmissions up to sustained temperatures of 175 °C and up to 190 °C for short periods. Are such rubbers still needed now that the end of the combustion engine has been heralded?

Klaus Kammerer, Senior Technical Consultant Elastomers in the Mobility & Materials segment at DuPont, is convinced that the AEM rubbers of the Vamac brand also offer many possible applications in electromobility: "With its resistance to water and non-polar liquids, the rubber can be used in applications where there is simultaneous contact with oil and water/glycol coolant." In addition, until a few years ago, the cooling medium for electric motors was assumed to be predominantly water and glycol, he said. "Today, oil is used for lubrication and cooling in the medium and higher e-vehicle classes." At 130 to 180 °C, he said, the temperatures are comparable to those of combustion engines, where Vamac rubber is already being used. AEM is even less sensitive to amine-added oils, which are now increasingly being used, than ACM rubber, which is generally considered to be more oil-resistant. Due to its low viscosity, the lowest of all oil-resistant rubbers, Vamac is still easy to process even when highly filled. "This also makes it easy to give it a flame-retardant finish, which means it can be used in oil-cooled electric batteries, for example," explained Klaus Kammerer. He sees further potential applications in fuel cell technology: "The hydrogen permeation is lower than that of liquid silicone, which is currently still frequently used for this purpose."

Sascha Hennig, Biesterfeld Performance Rubber: "Due to the large number of our raw material partners, we are not dependent on individual suppliers."

Dr. Dirk Kilian supports rubber processors in the procurement of raw materials.

Klaus Kammerer of DuPont sees good opportunities for AEM rubber in e-mobility.

Zeon also sees its ACM rubber as suitable for use in sealing applications in electromobility due to its good resistance to high temperatures and automotive fluids and has expanded the HyTemp ACM rubber range to include new grades that perform well at low temperatures. "The interest at DKT was high," said Hubert K. Thimm, commercial director of Zeon Europe. "This gives us hope that things are moving in the right direction."

The shift towards e-mobility is also felt by Karlheinz Schuster, Vice President Sales & Marketing at Krahn Chemie. "We see that the focus is somewhat less on high-temperature resistant materials," says Schuster. "Instead, thermal conductivity and flame retardancy are getting more attention." Fuel cell technology is also making new demands, he adds. With its extensive portfolio of special rubbers, plasticisers, adhesion promoters, processing aids, blowing agents, lubricants and release agents, the Hamburg-based raw materials distributor sees itself well equipped for this. Due to the supplier structure, there have not been any long interruptions so far. "There were isolated delivery delays," says Karlheinz Schuster, "but we could and can serve all our customers."

Hubert K. Thimm of Zeon senses great interest in the new ACM rubber grades.

Karlheinz Schuster, Krahn Chemie: "We support our customers in life cycle assessment."

Sustainability becomes concrete

There is another mega-topic that no one will be able to avoid in 2022. Sustainability is on everyone's lips, and companies are rising to the challenge. When it comes to tightening chemicals legislation, distributors like Krahn Chemie are under a double challenge. "On the one hand, we need suppliers who provide appropriate alternatives," explains Karlheinz Schuster. "On the other hand, we have to advise our customers intensively about these possibilities." This applies equally to the CO_2 issue, he adds. "We support our customers in life cycle assessment according to DIN ISO 14040/44." Not all manufacturers provide the necessary information on the CO_2 footprint of their products yet. "But we are working on that," Schuster emphasised. "And we want to get even better at it by carrying out the CO_2 assessment in a more differentiated way, for example not for a material group in general, but for a very specific product from a very specific manufacturer from a very specific production plant."

Biesterfeld Performance Rubber had brought a light-coloured calcium carbonate filler to the DKT. This is derived from oyster shells and can thus reduce the CO_2 footprint of products, according to Managing Director Sascha Hennig. "Applications in the consumer goods sector are conceivable," says Hennig. There is also increasing demand for PAH-free carbon blacks. In Cabot, the company has a partner who can meet this growing demand. "At the moment, we are also looking into the use of rubber flour," reported the Managing Director. The aim is to obtain and process single-variety waste. In this way, expensive special rubbers could also be partially replaced. "This is an interesting alternative both in terms of availability and with regard to the CO_2 footprint," Hennig is certain.

Filler alternative made from beech wood

A sustainable alternative to petroleum-based industrial carbon black and precipitated silica was presented by UPM. The

UPM's team presented a portfolio of biochemicals produced from sustainably sourced hardwood.

company, which has its roots in the paper and pulp industry, uses the lignin contained in wood for this purpose. Sales Manager Vishal Patil explains, "We have developed a process to produce a portfolio of biochemicals from sustainably sourced hardwood, including glycols and the filler RFF - short for Renewable Functional Fillers. The filler is used in compounds of elastomers, thermoplastics and thermoplastic elastomers and has a more than 90% lower carbon footprint than standard industrial carbon blacks, according to UPM. The carbon footprint of a rubber compound can therefore be reduced by around 50%.

In addition, RFF brings other advantages over traditional fillers. "Because of the lower density of RFF, the article weight decreases, RFF is not electrically conductive and is almost free of PAHs and VOCs, which is an interesting combination of properties for various applications," Patil lists. "In addition, thermoplastics coloured black with RFF are NIR-sortable and therefore recyclable."

UPM is currently building a large-scale plant in Leuna, which will go into operation at the end of 2023. The plant will use sustainably sourced domestic beech wood from a maximum radius of 250 kilometres. "Beech has had limited industrial use so far, so today more than 60 % is burned," Patil knows, "and we will put some of it to material use." As part of the new "Luvomaxx goes greener" strategy, Lehmann&Voss&Co. agreed to an exclusive distribution contract with UPM for the distribution of the renewable functional fillers RFF of the UPM BioMotion X10, X20 and X40 product range in Germany, Austria, Switzerland and the UK for the elastomers application field. "The UPM BioMotion products are an excellent addition to our extensive filler portfolio and can make a significant contribution to the reduction of the CO_2 footprint, as well as a more sustainable production of rubber and TPE compounds in the future," says Robert Zeppelin, Business Unit Manager Luvomaxx at Lehmann&Voss&Co. In addition, the Hamburg-based company has signed an agreement with the Indian company Brisil Technologies to evaluate the marketing prospects of a silica filler derived from rice husks. This precipitated "green" silica can be used as a filler in tyres, shoe soles, conveyor belts, cables, technical rubber articles, toothpaste, paints, varnishes, and plastics, among other things.

Copied from nature

In many applications with high dynamic stress such as tyres, natural rubber has been the only material available up to now. "Car tyres consist of 15 % natural rubber, truck tyres of 30 % and aircraft tyres entirely of natural rubber," says Dr. Boje Müller of the Fraunhofer IME. However, the natural product is not always sustainably obtained, can exhibit quality fluctuations, and the supply chains are not secure either. Synthetically produced polyisoprene rubber, however, does not keep up with its natural counterpart in terms of performance - especially abrasion. A research group from the Fraunhofer

DKG Managing Director Prof. Andreas Limper (l.) visited the Fraunhofer developers of biomimetic synthetic rubber (from left):

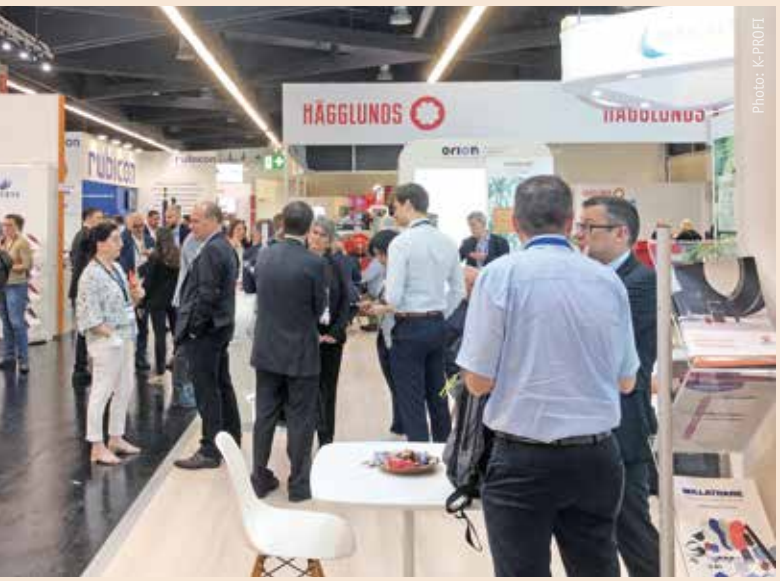
Ulrich Wendler (IAP), Dr Marlen Malke (PAZ), Dr Boje Müller (IME), Dr Sriharish Malebennur (IMWS) and Demet Acargil (IMWS).

Right side: The rubber experts were finally able to meet in person again at the DKT in Nuremberg.

UPM's lignin-based filler RFF is an alternative to petroleum-based industrial carbon black and precipitated silica.

Institutes IME, IAP and IMWS pinpointed the biocomponents contained in natural rubber as one cause. "We analysed these lipids, proteins and triterpenoids, then synthesised them and added them to synthetic polyisoprene," explained Dr Müller. In addition, a polyisoprene with very high cis proportions as well as functional end groups was synthesised following the natural model. The resulting biomimetic synthetic rubber – BISYKA for short – has even better properties than natural rubber, according to Dr Ulrich Wendler of the Fraunhofer IAP. "Tyres made of our synthetic rubber lose 30 per cent less mass than the equivalent made of natural rubber, the tread loss is only half." Another plus of the new development: the rubber can be produced on a large scale with existing equipment.

www.dkg-rubber.de



Elastomer processing in transition

How machine and equipment manufacturers are facing the current challenges

In view of material availability, the change in mobility and sustainability, raw material manufacturers and distributors were much in demand as discussion partners at the German Rubber Conference (see page 17). Machine and equipment manufacturers are also responding to these issues and had brought interesting new developments for elastomer processors to Nuremberg.

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

"The change in many places is clearly noticeable for us," said Harald Schmid, sales manager at injection moulding machine manufacturer Desma Elastomertechnik. In view of the uncertain situation, automotive suppliers are currently very reluctant to make new investments. "On the other hand, we have recently been able to break new ground with a number of projects," Schmid reported, citing green energies, batteries for electromobility and fuel cells as examples. In addition, there are, for example, large seals for pipelines in the infrastructure sector. "We have never developed and built so many large-scale and special machines in such a short time," the sales manager summed up.

CO_2 reduction is still often done away with

To make sustainability visible, Desma has developed a calculator that can be used to take a close look at the CO_2 balance of both the machine production and the operation of a rubber injection moulding machine. According to this calculator, the construction of an average machine generates a CO_2 footprint of between 50 and 70 tonnes. The annual energy consumption in operation causes 70 to 80 t of CO_2, the annual compound throughput around 500 t as a rather lower limit. "This clearly shows the potential for savings, which also means that the focus for investment decisions must be reassessed if the CO_2 certificates to be purchased are included in the future," emphasises Harald Schmid. "Often enough, appropriate technologies still are done away with."

For example, the use of the energy-efficient start-up of Desma machines with the EnergyControl+ system often fails because of the investment, if it must pay for itself within a short period of time through electricity savings alone. Schmid is convinced: "Further increases in electricity prices and, above all, the inclusion of the CO_2 price will

All photos: K-PROFI

Harald Schmid, Desma: "The CO_2 calculator clearly shows the savings potential in elastomer processing."

Martin Schürmann and Harald Schmid, Desma, at the new Sealmaster+ rubber injection moulding machine.

shift the calculation basis here." The biggest chunk, however, can be recouped through material savings. "With our cold runners, up to 30 % of the rubber compound can be saved," the sales manager calculates. In the past, the industry had thought that a cold runner had to pay for itself in 12 to 18 months through the price of the saved compound. "Taking into account the prices for CO_2 certificates will make the calculation look different here, too," Schmid is sure. In addition, there are other material-saving technologies such as PressureSense, which can significantly reduce scrap and start-up losses.

"Virtual machine acceptance and training can also save large amounts of CO_2 emissions," added Desma Managing Director Martin Schürmann. For this reason, the Fridingen-based company supplemented its DKT presence in Nuremberg with video links to the technical centre and gave interested parties who were not in Nuremberg the opportunity to be there "live" with the digital XpertForum. "We will do the same at K in Düsseldorf," explained Schürmann.

Live on site, the machine builder presented its newly developed horizontal machine platform Sealmaster+, which is available with the same dimensions in clamping force sizes of 3,000 and 4,000 kN and features more than twenty innovations compared to the previous version. "50 per cent more usable mould area, 60 per cent more opening stroke, 30 per cent more clear width for double-deck moulds and 27 per cent greater tie-rod spacing for easy mould changes and maximum brush width utilisation," Harald Schmid listed some of them. In addition, there is a further developed ActiveFeed generation for feeding problematic mixtures. A quick-release cassette now makes compound changes easier. "We have paid special attention to ease of maintenance," emphasised the sales manager. For example, the temperature control units and the vacuum pump are arranged on a retractable service rack. "This was very well received by the DKT visitors," Schmid was pleased to say.

One control system for everything

Injection moulding machine manufacturer Maplan presented a new automation concept in Nuremberg. "For an injection moulding machine automated with a rotary table, robot and cell protection, for example, several individual controllers have to be connected to each other via interfaces," says Maplan Managing Director Wolfgang Meyer, "although the injection moulding machine controller already provides everything that is needed." This is why the Austrian company relies on a one-for-all control system for injection moulding machines, peripheral devices and automation components, which are combined in a MAP.autocell. The MAP.commander cell control interface integrates all the controls of such a cell. On the machine terminal, it is easy to switch between machine and automation control, which both have the same appearance. "This way, the operator always has an overview of all processes," Meyer explains, "and can operate all system parts from one point." This allows the robot to be directly controlled, synchronised with the machine, and monitored. "Interfaces to third-party controllers with all their problems are thus eliminated," emphasises the Managing Director. The multifunctional control system can also be adapted to customer-specific requirements.

Becoming a system provider with cold runner systems

Maplan has also expanded its portfolio with an extensive range of cold runner systems. Closed or split cold runners with additional options as well as valve gate cold runners are now part of the possible

Volker Meyer: "With the new one-for-all control system, the operator always has an overview of all processes."

scope of delivery and were shown in Nuremberg. "This means that the machine and an ideally designed cold runner can be even better matched to the compound to be processed," Wolfgang Meyer is certain. "We have thus taken a further step from machine supplier to system provider."

Stand-alone cold runner control units developed by Maplan are not only suitable for controlling the company's own valve gate cold runner systems but can also control valve gate systems from other manufacturers without the need to retrofit control hydraulics or electrics.

Focus on ergonomics and sustainability

Maplan also showed two revised machine series. The top-closing, tie-bar-less C-frame vertical machines for processing TPE and rubber, which are available in five clamping force levels between 200 and 1,000 kN, were represented by an Easy+ TTP 85/50. This series is particularly geared to corner gating of hollow chamber and compact profiles, but is also suitable for producing small moulded parts.

The new Rapid+ 300 "2022" is the first model in the revised horizontal machine series, which is available in five sizes in the clamping force range from 2,000 to 8,000 kN. "During the redesign, the focus was on increasing the production speed for free-falling moulded parts such as O-rings, as well as on freedom from maintenance, precision and high long-term quality with the lowest possible energy consumption," reported Wolfgang Meyer.

The machine portfolio was completed with a vertical Ergo+ 250 equipped with a Fifo Ergo injection unit. "Ergonomics, together with the issue of sustainability, is always at the top of the agenda when we introduce a new machine technology," said Wolfgang Meyer. Platforms are a thing of the past with this machine design.

Flexible rubber injection moulding in individual steps

LWB Steinl has taken up the cause of making rubber injection moulding more flexible and presented a completely new approach with the multi-station concept. "The basic idea behind this is to decouple the sub-steps of injection, heating, demoulding and possible post-processing", explained LWB sales manager Peter Radosai. For this purpose, the mould in the machine is combined with a pool of interchangeable mould sets. These change moulds are transferred by means of industrial robots in a circuit between the injection moulding machine, external heating stations and subsequent demoulding and finishing stations and ultimately back into the injection moulding machine.

"This has several advantages," Radosai knows. "For example, the injection moulding machine is available for further injection cycles during the vulcanisation time." With an appropriate number of change moulds and heating stations, he says, this time can be fully utilised so that there is no break in the process. This in turn opens up a high degree of flexibility for the processor, he adds. "The system can grow from the prototype phase to large-scale production and can also be reduced again, if necessary," the sales manager made clear. "There is no need for an expensive multi-cavity mould that is then possibly not or only partially utilised." It is also possible to take individual exchange moulds out of circulation and

fill the free injection moulding capacities by producing similar moulded parts. "Even different cycle times are no problem here," Radosai emphasises.

The multi-station production cells can be individually designed and assembled around almost any vertical machine. For this purpose, LWB offers a whole modular system of options that cover the usual processes of moulded rubber part production. "For composite parts, thermoplastic injection moulding machines can also be included," said the sales manager.

Precise injection moulding technology for seals

In addition to two LSR applications, Engel also demonstrated its expertise in injection moulding technology for classic elastomers and solid silicone. O-rings made of silicone rubber were produced on a servo-hydraulic flexseal 500/300 T in a 102-cavity mould. "We have specially adapted this series to the special requirements for the production of O-rings and flat seals," reports Armin Mattes, Sales Manager for Elast/LIM/Thermoset machines at Engel. "The flexseal machines work very precisely thanks to the horizontal machine concept with screw injection unit." This is particularly important, he says, because of the often small shot volumes in gasket production. The machine manufacturer also followed the trend towards small shot weights with a new size of roto feeder. The rotary feeder for continuous, bubble-free and pressure-constant feeding of solid silicone and BMC is now also available in a 25-litre version in addition to the HCR 50 and 105 models. "This is suitable for small injection units up to the 50 size and 15-mm screws," said Mattes.

Pressure sensor in the cold runner

A further development of the hybrid cold runner system with needle valve nozzle was presented by M. Huber I.T.Σ. "Pressure sensors for process monitoring and control of the valve gate nozzle directly in the mould often bring problems," Managing Director Michael Huber is convinced. "If a sensor has to be installed in every cavity, it means a lot of effort. The products get a sensor imprint and mould cleaning becomes more complicated." That is why M. Huber I.T.Σ. has developed a sensor system in which a control signal transmitter module integrated directly in the cold runner takes over this function. "Existing cold runner systems from us can also be retrofitted with this," Michael Huber emphasised.

Elastomer presses at the cutting edge

The press specialist Wickert came to Nuremberg with the self-confident slogan "Pressing instead of injection moulding". Sales engineer Steve Büchner explained why and in which areas the traditional processing method has advantages: "Injection moulding requires materials that are as flowable as possible. The greater the flow paths in the mould, the more pressing processes come into play." But press technology can also score points when it comes to high precision and large quantities - for example, in the production of medical stoppers. "In the case of moulds for several hundred moulded parts, the flow paths to the individual cavities alone, which vary in length, can have a negative effect with injection moulding," Büchner explained. "With compression moulding, this is eliminated, and the same pressure exists in every cavity."

The sales engineer sees another strength in the customised design of systems: "While many things are standard in injection

Peter Radosai, LWB Steinl: "The multi-station production cell can grow from the prototype phase to large-scale production and can also be reduced again if necessary."

Armin Mattes, Engel: "Our flexseal series is specially adapted to the production of O-rings and flat gaskets."

moulding machine construction, our presses are almost all special machines, often in quantities of one. Depending on the requirements, we can draw on our expertise in compression moulding, transfer moulding and injection transfer moulding." As an example, he cites a system for large-area flooring segments made of a rubber material. "This operates with ten tiers and fully automated handling, including for loading and demoulding." Large parts with volumes of more than 100 litres can also be produced economically on presses using the transfer moulding process, for example. "High-quality parts with tight tolerances and cavity pressures of up to 1,000 bar can be produced reproducibly using short sprue channels."

The fact that the tried and tested press technology is at the cutting edge is also shown by the fact that Wickert systems are increasingly in demand in future industries. "Our presses are used, for example, in the production of seals for fuel cells or rotors for electric motors," reported Steve Büchner.

Michael Huber, M. Huber I.T.Σ.: "Instead of a pressure sensor in each individual cavity, process monitoring, and control is handled by a control signal transmitter module directly in the cold runner."

Simulation now also for presses

The continued popularity of compression moulding in elastomer processing has prompted Sigma Engineering to expand its Sigmasoft Virtual Molding simulation software to include modules that also map compression moulding. "Since a viable simulation option was previously lacking here, a lot of guesswork was used in the design of tools and parts, which did not always lead to equally good results," said Sigma Managing Director Thomas Klein. "Therefore, there is a great demand for this."

The challenge here was that the mould changes continuously when the plates are closed, and in the process the inserted blanks are already heated, plasticised, and deformed. "For the simulation, this means a movement of the grids we are calculating with," explains Klein. "That was tricky, but we were able to solve it." And so, with Sigmasoft, the compression moulding process can now be represented with cycle precision in time and location resolution. "For example, you can analyse the thermal influence of the open mould during the preparation and placement of the blanks, but also the plasticisation and vulcanisation of the elastomer," says Klein. Since, in contrast to the large thermoplastics market, many rubber processors work with their own compounds, there is comparatively little material data here, says the Managing Director. "Within Sigmasoft Virtual Molding, an open material database is therefore included, which allows the user to integrate material behaviour based on internal or external measurements and thus continuously expand their own material data sets."

Flow simulation with AI in the browser

Specialising in flow simulations is the spin-off Ianus Simulation, which was spun off from TU Dortmund University. "Our software StrömungsRaum uses artificial intelligence and can be executed cloud-based in the browser," emphasised project manager Maike Tegethoff. "The user does not have to purchase extensive software packages or sophisticated hardware." One of the core elements of Ianus is the 3D flow simulation for extrusion tools and screws - customers include well-known extruder manufacturers and extruders. "Compared to experimental investigations, such simulations are carried out quickly,"

Tegethoff explained, "and they allow a detailed insight into the process." Causes for dead zones, hotspots, turbulence, excessively high residence times or inefficient designs can thus be found quickly.

But Ianus' flow simulation also performs well in the design of hot and cold runner systems. "With a digital twin, various parameters can be analysed iteratively," says the project manager. The flow specialists also work together with the Polymer Application Center UNIpace, with which they shared an exhibition stand in Nuremberg. At UNIpace, the necessary rheological and thermal material data for the simulations are determined.

Research and production hand in hand

UNIpace is a joint project of the University of Kassel and the medical technology manufacturer B. Braun Melsungen. "We want to link scientific research in the field of plastics processing more closely with applied manufacturing with a focus on silicone rubber," says UNIpace Managing Director Dr.-Ing. Ralf-Urs Giesen. "Our activities include upscaling laboratory tests, optimising processing methods and introducing new process technologies." To this end, the facility has extensive technical equipment, including several injection moulding machines, extruders, mixers, analytical equipment and a 3D printer for LSR.

Convenient help for loading with inserts

Hahn Automation presented the LoadingDesk, a helpful handling device for loading small presses with inserts in rubber processing. The parts are inserted into a holder outside the machine during the heating time. Metal inserts are fixed magnetically, thermoplastic parts mechanically. The parts are then transferred to the open mould in one go. This has several advantages. "The mould does not have to remain open as long, which shortens the cycle time and reduces heat loss," says Christian Franzen, Project Manager Loading Systems at Hahn. In addition, he says, the dwell time of all inserts in the loaded mould is the same, so they do not heat up differently. "This is particularly important if they are coated with an adhesion promoter," Franzen emphasises. The LoadingDesk also checks whether all parts are present and ensures that they are in the correct position. In addition, there is a relief for the operator: "The worker does not have to work so long at high temperatures on the open press."

Customised extrusion lines in diversity

With now more than 30 years of company history, the family-owned Rubicon company from Halle/Saale, Germany, founded in 1991, has long been one of the established extruder manufacturers. "We supply turnkey complete lines for the production of technical and medical hoses and profiles made of rubber and silicone, but also for the tyre and cable industry," says Andreas Elze, responsible for engineering and sales. "For this, we design and build customised lines in combination with all relevant vulcanisation processes, quality testing and control as well as labelling and marking systems." In doing so, the people from Halle are not afraid of tricky tasks, such as a line for the production of a medical catheter tube that turns into a cross-shaped profile at its end. "Previously, two different products were extruded and glued together," Elze reports. "We have developed a continuous process for this." This is achieved using servomotors in the tool, each of which causes the cross-sectional profile to change at a defined point in time. "One challenge here was that the hose is not closed at the transition point to the profile," Elze emphasises.

Steve Büchner, Wickert: "While a lot of things are standard in injection moulding machine construction, our presses are almost all custom machines."

Thomas Klein, Sigma Engineering: "We have expanded our simulation software to include modules for compression moulding."

At the DKT, Rubicon had brought along a high-performance vacuum extruder EEK 90.21 V as an example of its versatile machines. A specially designed screw and a degassing barrel with connected vacuum pump ensure that highly volatile components are removed from the rubber compound. "This is particularly important upstream of continuous, pressureless vulcanisation lines, because otherwise pores can form in the end product," says Andreas Elze.

Surface and geometry together in view

For quality assurance in the extrusion of round profile products, Pixargus has combined the inspection of surface and geometry in one inspection system. "The All-RounDia DualVision uses optical methods for surface inspection and laser technology for inspecting the geometry," explained Sales Manager Michael Frohn. "With this combination in one device, we have a unique selling point in the market." The system works independently of colours and matt and glossy surfaces. "Our inspection technology also copes with the surface inspection of translucent and semi-transparent hoses," Frohn emphasised. A configuration adapted to the respective needs of the user is possible. Thus, surface and geometry inspection can also be used as separate units. The standard of eight optical cameras can also be reduced. The inspection system can furthermore be networked with other system components, whereby defective products can be immediately ejected by a cutter. "Control loops are also possible so that, for example, the machine settings are automatically readjusted in the event of geometric deviations," says the sales manager.

Sinisa Skarjan (left), Dr.-Ing. Ralf-Urs Giesen (centre) from UNIpace and Maike Tegethoff, Ianus, jointly presented their know-how in silicone processing as well as flow simulation.

Rolling mills with high safety

Even though very few rubber processors today still produce their own compounds, rolling mills are in operation at many plants - for preheating rubber compounds, mixing in vulcanising agents, producing compound strips or for reconditioning production residues.

A specialist in rolling mill technology is the family-run machine builder Deguma Schütz, which not only offers new machines, but also retrofits older plants as well as partially or completely overhauls used ones and puts them back on the market. In Nuremberg, the Thuringians presented their new generation of proven rolling mill technology, with which they deviate from the classic design. "Instead of housing the gearbox in the roll stand, we have attached the drive to the outside of the roll journals," explained Arno Herget from technical sales. "This makes all components easily accessible for maintenance." The neo roll stands, which are available in three versions from the standard model to the variant with the greatest possible customisation, bring further advantages. "They run quietly and with low vibration, in the premium model with individual drives

Christian Franzen, Hahn Automation, shows how to load the LoadingDesk with inserts for elastomer moulding.

This medical catheter tubing, which changes into a cross-shaped profile at its end, can be extruded continuously on a system from Rubicon.

the friction of the rollers is infinitely variable and even with difficult mixtures the motors do not overload so quickly," Herget lists.

Deguma Managing Director Viktoria Schütz added: "Our top priority is the safety of our machines and thus of the operators. We not only always orient ourselves to the latest standards, but also go beyond them." For example, during the emergency stop, the braking angle of the rollers is less than 15° and thus well below the 60° required by the EN 1417:2015 standard. In addition to an emergency box with important tools and aids, the company also offers safety training for employees at processors. "We always do these directly on site," emphasises the Managing Director, "because then the procedures can be practised in the environment of the specific local conditions. That's very important for correct behaviour in an emergency." To

Holger Hübing (left), Bosch Rexroth, and Jörg Schlegel, MaTech, demonstrate the new Hägglunds drive on a MaTech rolling mill.

Andreas Elze, Rubicon, shows the high-performance vacuum extruder EEK 90.21 V of the machine builder from Halle/Saale.

Anna Harth and Michael Frohn from Pixargus show the new inspection system for parallel quality control of surface and geometry during extrusion.

Arno Herget and Viktoria Schütz of Deguma Schütz present the advantages of the new generation of their rolling mills.

Photo: DKG

By founding a DKG women's network, women in the industry want to make themselves more visible.

limit the emergency risk in advance, Deguma Schütz offers additional technical equipment such as safety cages for laboratory rolling mills as a retrofit solution.

Energy consumption significantly reduced

Bosch Rexroth presented a new Hägglunds drive unit for rolling mills. "We have combined a servo motor with a hydrostatic transmission for this," explained Industry Sector Manager Rubber Europe Holger Hübing. "The adjustable axial piston pump in combination with a radial piston motor serves as an automatic, continuously variable transmission. The frequency converter reduces the speed of the servo motor down to zero as required, thus significantly reducing energy consumption." Bosch Rexroth pre-assembles the drive unit in six sizes and delivers it as a plug-and-play solution. Like an electromechanical drive, it can be easily connected to the shaft in any position and is therefore also suitable for retrofitting to existing rolling mills.

"The two-channel safety circuit even significantly exceeds the specifications of DIN 1417, according to which the braking angle for an emergency shutdown must not exceed 60 degrees," says Hübing. "With a braking angle of six degrees, we offer the fastest emergency stop on the market." The new drive was demonstrated live at a rolling mill of the mechanical engineering company MaTech from Lutherstadt Wittenberg, which specialises in the repair, maintenance and modernisation of technology for mixing plants. "However, we also manufacture customised plants and equipment as new machines according to individual applications and uses," emphasised MaTech Managing Director Jörg Schlegel.

Networking at the DKT

The "accompanying trade exhibition" of the German Rubber Conference has grown more and more over the years and has meanwhile developed into one of the most important trade fairs in the rubber industry. However, the event still remains a good opportunity for networking. Thus, informal interest groups such as the TPE Forum met in Nuremberg again this year. The TPE experts involved here see themselves as an open, neutral platform and want to support users and processors in promoting the use of thermoplastic elastomers in the various markets.

Women in the industry mobilise

In addition, on the initiative of the 2nd Chairwoman of the German Rubber Society, Dr Christine Bergmann, and other members, an informal meeting was held to establish a DKG women's network. "The proportion of women in our industry is still underrepresented and unfortunately far too invisible," said the initiators. Yet the rubber industry offers not only men but also women attractive jobs and exciting careers. DKG Head of Office Michael Patrick Zeiner also says: "I think it is important that we make women more visible in industry and science." The DKG therefore expressly supports this idea and wants to further promote the exchange of ideas as well as provide relevant contacts for careers. After the first meeting in Nuremberg, a kick-off meeting will take place in September at the House of the Rubber Industry in Frankfurt/Main.

The next DKT will be held in Nuremberg from 1 to 4 July 2024.

www.dkg-rubber.de

Taiwanese plastics machinery manufacturers catch up

How injection moulding, blow moulding and recycling machines from the island in the West Pacific are conquering new markets

In the World Competitiveness Yearbook 2022 of the Swiss Institute for Management Development (IMD), Taiwan ranks seventh among the most competitive economies in the world. The Taiwanese government is supporting the mechanical engineering industry to further increase its competitiveness. To this end, it has launched the development programme for intelligent machines. With Industry 4.0 technologies such as Cloud, Big Data, Internet of Things and intelligent robots, the journey is to go from precision machines to intelligent machines.

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

Taiwanese manufacturers can rely on an extensive network of suppliers to avoid production bottlenecks and to shorten delivery times. This has also paid off in the Corona pandemic. In recent years, Taiwanese industry has turned to creating entire production lines to increase its competitiveness. For example, plastic injection moulding machine manufacturer Multiplas has collaborated with Shun Chan, a contract manufacturer specialising in shoe soles, to develop the world's first specialised, intelligent, continuous production line for sports shoe soles. This has shortened the manufacturing process from four days to 20 minutes. The product is manufactured entirely in Taiwan.

The quality of toolmaking is also improving steadily. The machining standards of Taiwanese mould makers now deliver high precision and come close to the moulds of the world's leading manufacturers. Taiwan plays an important role in the global machine tool industry. It ranks fifth in terms of production value in the machine tool sector and sixth in terms of plastics manufacturing machinery.

Exports of plastics machinery from Taiwan in 2021 have almost returned to 2019 levels *(see chart 1)*. In contrast, from 2019 to 2020, Taiwanese plastics machinery manufacturers recorded a decline of 11.1%.

Chart 1: Export value of plastics machinery 2019-2021

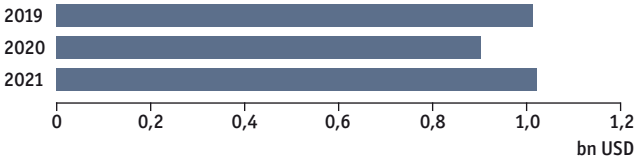
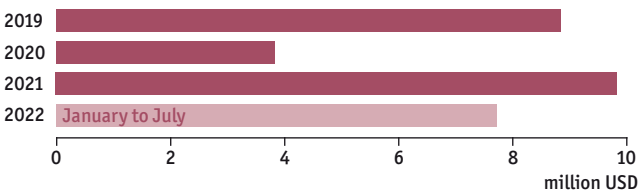


Chart 2: Export of plastics machinery from Taiwan to Germany



David Lo, Polystar, explains: "The demand for recyclates is constantly growing. I am sure their use will continue to increase."

The most important export markets in 2021 were China in first place, followed by Vietnam, the USA and India. Germany ranks 20th and is the most important European market for Taiwanese plastics machinery manufacturers, along with Poland, which ranks 18th. Exports to Germany amounted to USD 9.78 million in 2021, an increase of almost 157% compared to the previous year. The German market has therefore developed positively for Taiwan's plastics machinery manufacturers in recent years *(see chart 2)*.

Positive and negative consequences of the Corona pandemic

Like everywhere else in the world, Taiwanese plastics machinery manufacturers have seen their business drastically changed by the Corona pandemic. Companies are feeling the effects on many levels. Susan Wie, Sales Director at Fong Kee International Machinery (FKI) puts it in concrete terms: "Costs have gone up, lead times have increased significantly. All items from steel, chips, drives, PLCs to simple things like cables are in short supply and expensive. On top of that, sea freight costs have risen sharply and there is a lack of manpower, due to illness-related absences. This leads to delivery times of nine to twelve months. This is absolutely unusual for us, because we normally deliver within four to six months!"

This trend is not only observed by FKI. FCS and Polystar also faced similar challenges. The development did not surprise David Lo, Head of Marketing at Polystar, after the onset of the pandemic and

he reacted early: "We stockpiled numerous electronic components and microchips after the first cases of Covid 19 became known and built up a large warehouse. We are still benefiting from this today, as it has allowed us to maintain production at a relatively normal level."

In unison, Taiwanese machine builders affirm the change in their communication and maintenance structures. Travel and direct contact were difficult. However, with online maintenance tools on all machines, it was always possible to connect to the machines and assist customers with error messages or maintenance work. Hank Wu, Overseas Sales Manager of FCS Group, adds: "We held marketing events virtually, webinars, online exhibitions and video conferences. This has allowed us to stay close to our customers. We have seen a relocation of production sites during Corona. This is something we have benefited from." Due to high freight costs and global supply chain uncertainties, two major FCS customers have moved their manufacturing from China to Mexico and the US. The two automotive suppliers produce for Tesla, among others, and wanted to ensure their ability to deliver with this relocation. A


Photo: FCS

"We are looking to expand in Southeast Asia, especially Vietnam, Thailand and Indonesia," says Hank Wu, FCS.

stroke of luck for FCS, explains Wu: "We were able to sell numerous injection moulding machines to North America and thus compensate for a good part of the poor business in Europe. Business with North America in 2021 was really excellent."

FKI: All-electric blow moulding machine saves energy

For FKI, business was good in 2021 despite the difficult market conditions. Sales increased by more than 30% in 2021 compared to 2020, and again North America was high on the list with an increase of almost 60% from 2020 to 2021. FKI also made strong gains in Europe. Its share of total sales rose from just 3% in 2020 to 12.5% in 2021. China, on the other hand, is steadily losing ground. Turnover there fell in both 2021 and 2020. In South Asia, sales increased almost threefold in 2021 compared to 2020. Wie explains the good development in Europe as follows: "We have delivered a machine to Northern Europe for the first time in the company's history. This shows that we can deliver the quality that European customers expect. Europe is the most demanding market, and we are very proud that we can hold our own there." At K, the company will be showing an all-electric blow moulding machine as a single-station model. The machine will live produce a

An injection moulding machine from FCS at a customer in Portugal.

Recycling machine from Polystar at a Turkish customer.

A machine from FKI produces components for the automotive industry. The customer has been working with FKI since 2015 and has already purchased 19 machines.

20-litre canister made of HDPE, which is just as suitable for vegetable oil as it is for transporting chemicals. In real life, the machine uses in-line extrusion to produce a 3-layer film with a core of post-consumer recyclate. From Wie's point of view, the machine brings numerous advantages: "Compared to a hydraulic machine, the all-electric one saves up to 30% in energy. This improves the carbon footprint." In addition to the positive environmental features, the machine also has a smart manufacturing control system. All production data can be collected and recorded for analysis: Raw material consumption of virgin material, regrind, masterbatch, energy consumption. Preventive maintenance instructions are also part of the machine concept. The entire system uses a digital communication protocol.

FCS: New all-electric multi-component injection moulding machine

With 50% of sales, China remains the most important market for the FCS Group, followed by the USA. But the company is setting its course in other directions. Wu explains: "We want to expand in Southeast Asia, especially in Vietnam, Thailand and Indonesia. We have sales offices there and our own production facility in India." The large 19,000 kN two-component injection moulding machine with horizontal rotary table is particularly popular with automotive suppliers for electric vehicles.

At K, FCS will be showing the FB-400R servo-hydraulic multi-component injection moulding machine with 4,000 kN clamping force. It produces food containers made of PP with a TPE seal at the fair. The company's new developments – all-electric multi-component injection moulding machines with clamping forces between 1,800 and 2,800 kN – can be seen via a multimedia presentation. The new series scores

with a rotary table that is up to 50 % faster, more stable switching speeds and a positioning accuracy of up to 0.005°. The tie bars are not held by the plates to reduce contamination, abrasion, and power consumption, making the machine suitable for medical products. The use of servo motors and multiple independent cylinders for injection significantly reduces cycle time. The linear guide on the injection unit ensures that the back pressure approaches 0 during injection, reducing melt overflow. The heating zones of the barrel are accurate to 0.1 °C to ensure stable plasticising of the material. The screw position is controlled within 0.01 mm to precisely control the shot weight. "Our goal is to be able to deliver the new machine to Europe in the course of next year," affirms Wu.

Polystar: New recycling plant with cutter compactor

Despite Corona, Polystar's European market share has grown over the past two years. With representatives in ten European countries, Lo is looking to expand the business further and is confident about the future because: "The demand for recyclates is growing steadily and I am sure their use will continue to increase." In response to the increasing demand for recycling solutions, the company has developed integrated recycling equipment with a cutter compactor – the Repro-Flex cutter compactor recycling system. The cutter compactor system is equipped with a reverse feed and deflection structure that improves recycling efficiency. The machine's patented fully automatic granulation system uses digital programme logic and ECO inverter modules. In addition, the pelletising system is complemented by pneumatic constant pressure control technology so that the pelletising blade can be stably fixed to the surface of the die, improving pelletising stability. At K, Polystar will be showing the Reproflex 85 model from the new series live in action.

The Industry 4.0 aspect is also not neglected at Polystar. An intelligent electronic PLC control system with a visual and user-friendly HMI interface allows for easy operation. The electronic control system combined with the intelligent IP-based remote monitoring module enables real-time online troubleshooting, training and education, data collection and analysis, and optimisation of production parameters. According to Lo, these features have proven particularly useful in times of Corona: "We have not been able to visit our customers in person, but we have been able to stay in touch with them and their machines. Our technicians can connect remotely to the machines at the customer's request and approval and troubleshoot and attend maintenance work together with the plastics processor's specialists."

www.twmt.tw; www.fcs.com.tw
www.fki.com; www.polystarco.com


Photo: FKI

Susan Wie, FKI, is satisfied: "We can deliver the quality that European customers expect."

As much drying as necessary – as little energy as possible

Aachen-based start-up enables plastics processors to make their production processes more flexible

"Are you marketing already or are you still drying?" This is how Daniel Stricker, Managing Director of B.IRD GmbH from Aachen, formulates a not entirely serious potential advertising slogan. What he wants to express with this is the essence of the business idea behind the start-up founded by the two brothers Daniel and Urban Stricker almost two years ago: Faster drying means faster production; less energy input means more efficiency. Clear advantages that every plastics processor strives for, regardless of the raw material used and the processing machine. What is exactly behind this, the two explained to K-PROFI during a visit to the IKV Institut für Kunststoffverarbeitung (Institute for Plastics Processing), where the first European prototype for a research project is located.

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

The scientific lead of the start-up B.IRD is Urban Stricker, who, as a materials scientist, has been working on drying technology since the 1990s, received many patents and, among other things, developed the infrared rotary kiln (IRD) technology, which is successfully used by various licensees worldwide. "It's very simple: in the infrared rotary kiln, we combine the Archimedean screw with energy in the form of light, in our case infrared light," he explains, before acknowledging that the device is not so low-tech after all. "With our baby IRD, we want to clearly differentiate ourselves from the systems that are on the market so far. We are not competing with the existing licensees but offering something new with different possibilities. Even though the technology behind it is similar in principle, of course," clarifies Daniel Stricker, who is responsible for networking, sales, and administrative tasks in the company.

The two start-up founders explain the advantages in more detail at the plant, which is located in the IKV. First of all, it is a small unit that is designed in a lightweight construction so that it can be used flexibly and for lower throughputs. It has a drying capacity of between 20 and 150 kg/h, depending on the type of material. This means that it can be used either for small-volume compounding on an extrusion line or – as in Aachen – mounted directly on an injection moulding machine and the material, which is dried in only about 5 min, can be fed immediately into the hopper. This is one of the advantages of the small rotary kiln. Compared to conventional drying systems, which are often located in a completely different place in the production hall than the processing machines themselves, the dried granulates from the IRD no longer need to be transported. "The sometimes very long transport of dried granulates through piping systems results in renewed moisture absorption, which can hardly be avoided," says Urban Stricker, describing the current state of the art. In addition, the efficiency of a conventional dry-air dryer and its drying result depend on the ambient conditions, which are of course completely different in warm, humid countries like Thailand or India than in winter in Canada. The ambient conditions are almost negligible with an IRD placed directly above the processing machine. It works independently of them.

All photos: K-PROFI/Leonard Regel

Daniel Stricker: "One possibility is to mount the B.IRD on the injection moulding machine so that pre-dried material goes directly into the hopper."

Inventor Urban Stricker sees significant savings potential in the drying process for compounders and injection moulders with the IRD technology.

Thanks to its lightweight construction, the drying unit is quickly ready for use again: simply remove the rotary tube from the housing and replace or clean it.

Low investment costs thanks to alternative technology

How does the B.IRD work? The material to be dried is fed into the rotating tube and conveyed through a spiral system towards the outlet. During its dwell time, the granulate is irradiated by infrared emitters mounted above the rotating tube. The trick is that the IR rays penetrate the material, cause the polymer chains to oscillate and heat them in such a way that drying takes place from the inside out. The water contained in the solid is released to the cooler ambient air by the heating, which is conveyed to the outside of the rotary kiln and discharged. Drying in conventional dry-air dryers is completely different, as the material is dried from the outside with the help of hot dry air, which absorbs the moisture and thus cools down. The dry air therefore requires a regeneration unit with desiccant to dehumidify it. Then, in turn, the regenerant is heated and dried. The conventional process is therefore actually a two-stage process: first the granules are treated and then the desiccant. With the IRD, there is no need for any additional equipment, which leads to low maintenance costs. "The investment costs for our flexible drying unit are also comparable to those for a conventional dry air dryer with similar throughputs. If you consider that no conveyor technology is needed to transport the dried material from A to B, it even becomes cheaper," Urban Stricker further introduces his latest baby.

Preheating increases production efficiency

"Free-flowing material put into the Baby IRD is usually at the exact temperature level the customer wants within two to eight minutes," Daniel Stricker names another advantage of the unit, which is suitable for high-temperature (HT) treatment without any other equipment. Urban Stricker adds: "We recommend drying and heating the material until it is 'al dente'." By this he means a temperature level just below the glass transition temperature (Tg), so that the polymer is already significantly heated but not yet plastic. "Initial tests have shown that the melting of the granulate preheated in the IRD can take place in the injection moulding machine with significantly less shear energy, which not only saves energy, but is processed much more gently," he reports further. In this way, even long glass fibre-reinforced pellets could be processed with the greatest possible retention of fibre length. Furthermore, initial trials with ABS and PC products showed that the end product quality was improved. "We were able to determine that the number of defective parts, i.e. rejects, is lower when preheated granulates are processed," report the two Managing Directors, thus underlining the improved production efficiency when a B.IRD is used directly on the injection moulding machine.

Fast production changeovers possible

The lightweight design of the IRD not only allows its flexible use on a different injection moulding machine by simple changeover, but also easy cleaning. When changing the product, an operator can remove the rotary kiln from the housing with one hand and either clean it directly or replace it with a second rotary kiln, so that the drying unit is immediately ready for use again. Finally, the alternative drying unit does not require a long preheating time but can be started up or shut down at any time. During the drying process, a deionisation unit prevents the granulates from becoming statically charged so that bridging does not occur in the hopper of the injection moulding machine.

Daniel and Urban Stricker, who are presenting the B.IRD for the first time at K 2022 *(Hall 6, Booth D76)*, initially intend to sell between 10 and 20 machines directly to processors over the next year and a half. "We see disruptive potential in the technology. This suggests concepts such as an OEM business open to all interested parties for more widespread use. Cooperations for the development of pre-plasticisation with machine manufacturers who could combine our technology directly with their processing machines are also very conceivable," says Daniel Stricker.

www.ir-drum.de

Large parts and large quantities

How Brüderle is solidifying its niche among contract injection moulders

As a contract manufacturer, Brüderle Kunststofftechnik GmbH, Rheinhausen, processes several thousand tonnes of plastic granulate a year on more than 50 injection moulding machines. For the family business, 2021 signified the best year in the company's more than 60-year history. The Baden-based company benefited from the Corona-related restricted transport of goods from China and booming demand for garden products. Peter Brüderle and his son Pierre, who run the business, describe how Brüderle realises the flexibility and responsiveness that is highly valued by its customers and what hurdle the neighbouring Europa Park amusement park in Rust poses.

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

Well-known brands from the household goods industry, sanitary technology, toy industry as well as building and gardening supplies are among Brüderle's customers. In the five production halls in Rheinhausen, inserts for baby bathtubs and housings for loudspeakers come off the production line, as do diffuser discs for shower heads or storage boxes for sewing accessories. "We don't rule anything out. Whatever fits our machinery as a product, that's what we manufacture," says Pierre Brüderle. This means that the industry mix is broad. "In the beginning, we were more focused on the household sector, but for a few years now we have also been operating in technical areas such as sanitary technology and gardening supplies. Sometimes we also do automotive engineering. This broad positioning pays off time and again. If one area is weaker, another compensates. Especially in Corona times, this was a great advantage." The limited transport of goods from China and overseas also contributed to 2021 going down as the best year in the company's history.

Brüderle manufactures for well-known brands from the household goods industry, sanitary technology, toy industry and building and gardening supplies.

Pierre Brüderle: "We don't exclude anything. What fits our machinery as a product, that's what we manufacture."

Peter Brüderle: "Our overhead is low, which is reflected in a good price/performance ratio."

Brüderle is a typical family business. Initially founded to produce tobacco products over 60 years ago, it later continued with the production of buttons and rubber gloves. Brüderle put its first injection moulding machine into operation in 1969. Since 1990, the company has been manufacturing at its current location. "My wife Sabine is responsible for accounting and production planning, my son Pierre is in charge of technology and new customer acquisition, my daughter Nadine Brüderle is responsible for purchasing and administration, and her husband Manuel Brüderle manages production. Our overhead costs are low, which is also reflected in a good price/performance ratio for our customers," says Peter Brüderle happily. Absolute reliability and quick response to orders are further consequences of this constellation. "We have a family-like relationship of trust with all our customers. Our customers know that they can rely 100 per cent on our deadline promises."

Wide-ranging production technology

The generous machine park in terms of size, number and equipment also contributes to this. The clamping force range from 200 to 18,500 kN and shot volumes up to 19,700 cm³ are handled by 52 injection moulding machines for standard injection moulding. "For a contract injection moulder, we are very well positioned," Pierre Brüderle is convinced. "We have significantly more machines than

All photos: K-PROFI

Left: The water-bearing channels of this technical component require adherence to tight manufacturing tolerances.

Top: Brüderle relies on Wittmann's easy-to-program linear devices for part removal.

Below: Above-average number of modern injection moulding machines with comprehensive options open a high degree of flexibility.

The 18,500 kN machine from Haitian's Jupiter series marks the upper clamping force limit of the machine park, which starts at 200 kN.

we theoretically need; a 70-percent occupancy means quasi full capacity utilisation for us. Our cost structure is such that we can afford this flexibility. That is our strength." Especially for the production of promotional goods for the household industry, the above-average number of machines is an advantage. "For such promotions, sometimes up to ten machines might be necessary at the same time. We are able to process even such large orders at very short notice." Regularly running moulds remain on machines that have already been written off, even during production breaks of several days or weeks. The set-up effort is thus reduced to a minimum. In addition, injection moulding machines can be pre-set with time to spare. "We always put five or six machines into the pre-production phase. When articles run out, the next machines are immediately ready for operation. In this way, our staff is continuously busy in three-shift operation." Some orders have been running for years with the same product. "Those are the dream orders, of course. In general, we aim for orders with an average minimum running time of one week. Small batches are not our metier. Our speciality is large parts and large quantities." Most orders reach Brüderle through recommendations.

For the large machines in particular, Brüderle relies on the Chinese brand Haitian, which is represented by Hewaco Spritzgießtechnik from Waldkirch.

Continuous investment and expansion

Since the change of location in 1990, Brüderle has continuously expanded production in Rheinhausen. The first large machine hall was built in 2000, and another significant expansion came in 2006 with a major order. "Within two years we had quadrupled our sales. We needed to adapt our infrastructure and built another hall and a warehouse," Peter Brüderle reports. "When we get an order, we invest accordingly – but always with foresight," adds son Pierre. "What we earn flows back into the company." New machines are added almost every year. With the construction of a new 1,900 m² production hall in 2017, Brüderle created the conditions for operating large machines with clamping forces of up to 25,000 kN: even more space and stronger indoor cranes. Prior to that, the machine range ended at 13,000 kN. "The purchase of our largest injection moulding machine to date in 2020 was another milestone. It enabled us to jump to 18,500 kN and produce parts weighing up to 20 kg. Among contract injection moulders, not many operate such a large machine."

Brüderle relies on a mix of three suppliers for injection moulding machines. "We have grown with the Battenfeld and Ferromatik machines. And we have quickly familiarised ourselves with the technology from Haitian. We want to stay with these three manufacturers. For us as a contract moulder, the dimensions and the equipment are important. And of course, there are price differences. Each machine has advantages and disadvantages," says Pierre Brüderle. Brüderle bought many injection moulding machines through Hewaco Spritzgießtechnik GmbH from nearby Waldkirch. The provider initially specialised in service, overhaul and used machine trading of the Ferromatik brand and has been Haitian's trade and service representative for southwest Germany

All production rejects are ground on site, processed and returned to the cycle.

Up to 6,000 pallet spaces are available for shelf or block storage of finished parts.

since 2016. In the meantime, Brüderle also operates eight injection moulding machines from Chinese production, mainly large machines.

Servo-hydraulically driven injection moulding machines are the most flexible for the contract injection moulder. "We buy the machines with as many options as possible so that we can always offer our customers the right equipment," explains Pierre Brüderle. "We also have six fully electric machines, which were a quantum leap compared to fully hydraulic ones. In the meantime, servo hydraulics are our standard. The energy consumption is comparable to electric, but servo hydraulics are not only easier to maintain, but also cheaper to buy and for spare parts." The injection moulds used are usually customer property and are usually in use at Brüderle for years. "We work with large OEMs who do their own engineering and procure the moulds themselves. We carry out minor mould repairs ourselves during the runtime."

The production facility is designed to process up to 45 tonnes of plastic per day. The actual annual consumption is in the order of 5,000 to 10,000 t. For large orders, eight

silos are available, for smaller quantities Brüderle uses bagged goods. A centrally installed drying plant had turned out to be impractical. In the meantime, drying is done – if necessary – with small, easy-to-clean, decentralised units at the machine. Add-on mills at the injection moulding machines ensure that sprues are ground and dosed in immediately. "If that doesn't work, we collect sprues and rejects centrally, process them by type and send the material through dust removal and metal separation. We have all that in-house. We can reprocess most of it; we only sell about 50 tonnes a year to a recycler. That's less than one per cent of our total material consumption," says Pierre Brüderle happily. Up to four different plastics can be added at the injection moulding machines. "We can adjust regranulate proportions entirely according to customer requirements. If we can use black material for a product, 100 per cent regranulate is also conceivable. Because more colours are in demand today, especially in the household sector, reuse is more limited than in the past."

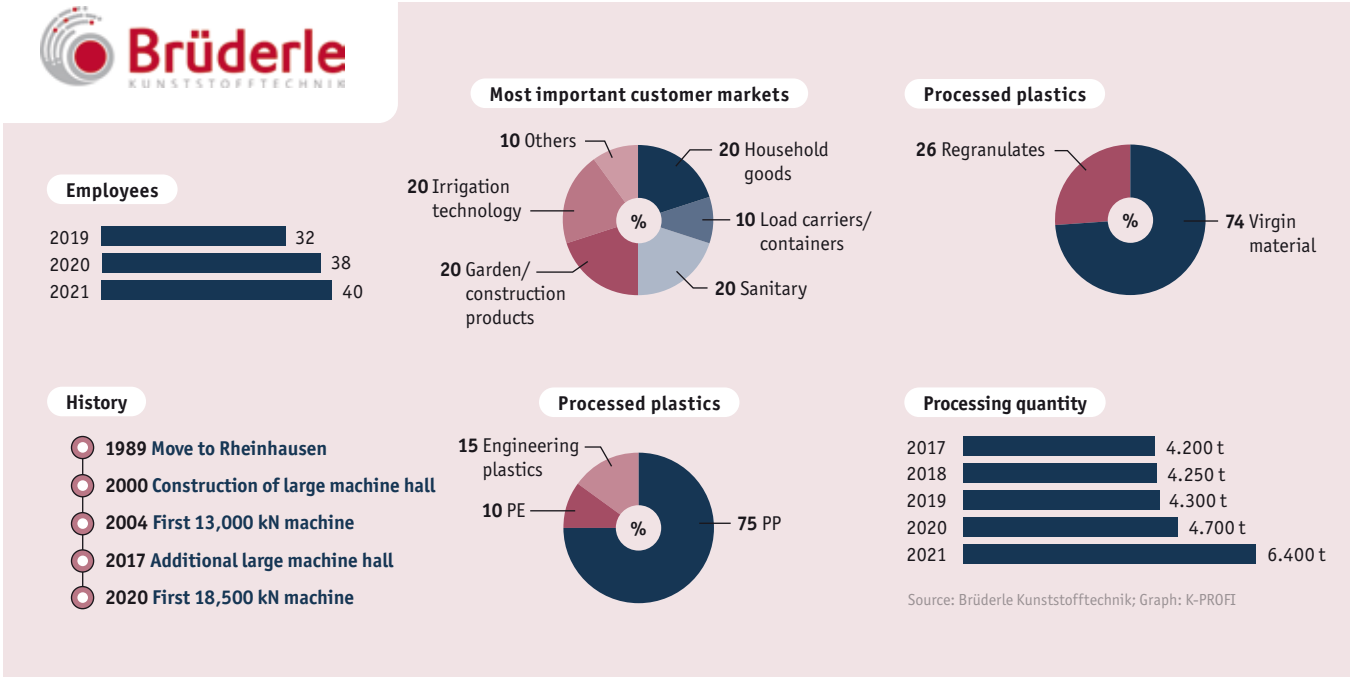
Large area allows storage service

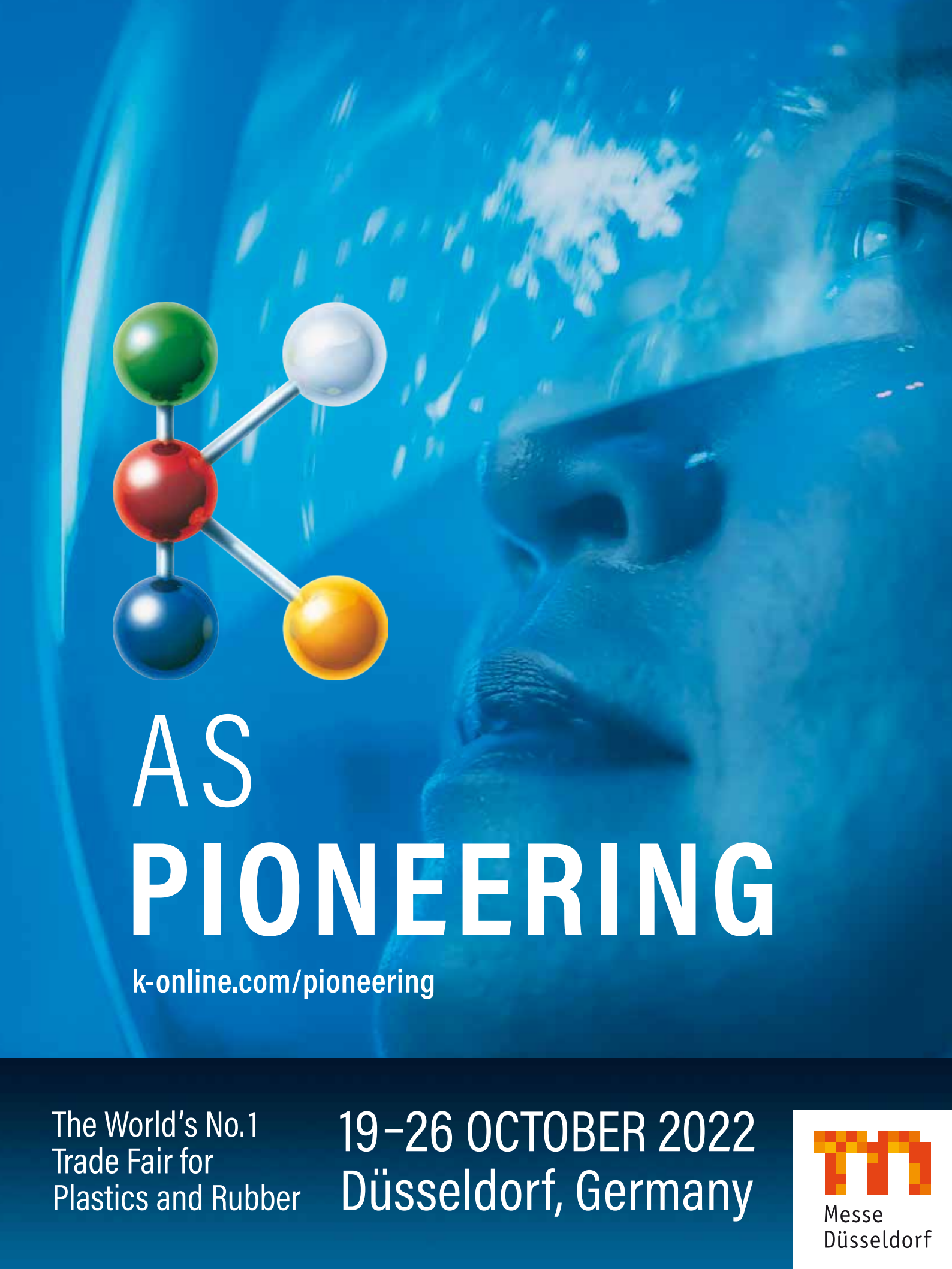
A special feature of Brüderle is the enormous storage capacity. Depending on the size, up to 6,000 pallet spaces are available, and each space is clearly allocated in the ERP system. "We always have parts worth about one million euros in stock. The customer does not pay any rent for this." This also contributes to the high flexibility. "All small products are in stock for three months if desired. The customer can retrieve them within 24 hours. We produce again when it fits in with the schedule." In addition, Brüderle delivers directly to the central warehouses of large discounters. "The fact that we can easily store 1,000 pallets for an order is an absolute advantage." The high storage capacity also pays off in times of material shortages. "If we pre-produce and buffer for certain types of material in stock, our customer can bridge these times well."

In addition to the current uncertainties such as raw material shortages and energy costs, finding personnel has been a major challenge for many years. "Only a few kilometres away is the Europa-Park Rust amusement park, which draws away potential employees for production assistance as well as mechanics. And in the area of skilled workers, we additionally compete with larger injection moulding companies as well as toolmakers from the region," reports Peter Brüderle. Therefore, the view into the future has also shifted slightly: "Our actual vision was to operate even larger machines in the future and to expand. However, the personnel situation limits strong growth. We will therefore continue to invest in new technology, modernise the existing stock and possibly go one step further in terms of machine size," admits Pierre Brüderle.

www.kunststoff-bruederle.com

Starting in 1990 with a small production hall, Brüderle has since continuously expanded its production and storage capacities.

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Further growth with "green" compounds

Why the Italian compounder Sirmax relies on extruders made in Germany

The Italian Sirmax Group, headquartered in Cittadella, wants to increase the share of biocompounds and compounds based on recycled materials in its product range from 10 % to 25 % by 2025. The compounder, which currently has a production output of 260,000 t, has set the course for this in the last three years. The companies SER and Microtec were acquired, new production facilities were set up in North America and Poland, six new extruders were purchased, employees were hired and a total of 80 million euros were invested, especially in the "Green" business unit. "There is a huge interest in green products," says Marketing and Promotion Manager Leonardo Forner, "a large part of our conversations with customers revolve around sustainability and recycling."

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

The Sirmax Group, with its current production output of 260,000 t at 13 production sites, claims to be the No. 1 independent compounder in Europe and No. 5 worldwide. It is active in 37 countries, employs 850 people and achieved a turnover of EUR 480 million in 2021, which was 20% higher than in 2020.

Its core products are PP compounds, mineral or glass fibre filled, technical compounds based on PA6, PA66, PBT or PC, styrene compounds, TPE compounds and green compounds. The latter are produced either from recyclates or from organic raw materials, and these in turn from both those that come from renewable sources and those that are biodegradable. With its broad product range, the Sirmax Group primarily serves the automotive industry and manufacturers of white goods, but also manufacturers of other household and electrical appliances as well as the furniture and construction industries. One of the reasons for the group's success is its proximity to its customers, which is not only reflected in its many locations and production sites around the world, but above all in its open ear for customer wishes. It is precisely from these that the company has been listening to the increased interest in sustainable compound alternatives in recent years and has fully adapted to it.

All photos: Sirmax

"Recycling and sustainability are the number one topic in many customer discussions today," says Leonardo Forner.

The future belongs to sustainable compounds

Today, Sirmax already manufactures many of its product families with a proportion of recycled material. "In our r-PP compounds of the Green Iso line, the recycled content is at least 30 per cent," explains Leonardo Forner and assures that this does not significantly change the defined property profiles. HDPE, which can be used for pipes and cables, but also for disposables and packaging, is already available from the Italian company in 100 % recycled material. Compounds for white goods and non-visible parts in the automotive industry are also available with recycled content of up to 100 %. "This allows our customers to meet their own targets of a lower carbon footprint and high recycling rates," Forner is convinced. However, he also sees the procurement of recycled goods increasingly as a problem. "Post-industrial goods are hard to come by because there is so much interest in these residual materials, most of which are reprocessed in-house and thus don't even reach the market as a material stream." Sirmax is therefore building its own supply chains. "We support many development projects with customers and universities to secure input materials." Fortunately, collection and recycling rates have improved significantly in Italy in recent years. Although Italy still has some catching up to do with its recycling rate for plastics, it is also aiming for 55% by 2030. "We work together with the waste management company Corepla and purchase Italian recyclable material residues, process them and mix them with our compound production," Leonardo Forner reports further.

Biodegradable and compostable compounds are produced at the Microtec site in Mellaredo di Pianiga.

Growth strategy also in North America

Following the purchase of SER S.r.l. from Salsomaggiore Terme, also in Italy, in 2019, the compounder decided to build a new plant on a greenfield site in North America. SER North America is located directly next to the Sirmax site in Anderson,

Indiana, and specialises in the production of compounds with high recycled content, such as Green Isoplen, a 100% recycled PP. "With the North American company, we are not only underpinning our growth strategy, but clearly want to establish European recycling efforts in the USA and increase the share of sustainable plastics in the market there". The r-PP produced at SER is used to make compounds at Sirmax's neighbouring site as well as for customers' industrial applications. For the production of the compounds in the USA, Coperion from Stuttgart recently delivered a ZSK twin-screw extruder. It was part of an order for a total of six extruders, three of which were installed at the plant in Poland, which was built in 2019, and the last two of which will be used for R&D activities in Italy, one at the main plant in Cittadella and one at the production facility in San Vito al Tagliamento. The order to Coperion was part of a total investment of EUR 10 million, which also included melt pumps from Maag and metering systems from Brabender. The significant investment enabled the Sirmax Group to increase its production capacity in Europe by 10 % and in the USA by 15 %. In this way, the 40 % increase in demand for technical compounds and the 15 % increase in demand for PP composites can be met.

Sirmax is also involved in research projects with universities in America, for example with the two universities MIT and UMass Lowell, both in Massachusetts. UMass Lowell, he says, is the first university in the US to look at the use of r-PE and r-PP in injection-moulded packaging applications. "We are the only non-US company here supporting the project with an annual investment of US$100,000," Leonardo Forner reports.

Machine technology and availability are crucial

In order to be able to serve its large international clientele in 37 countries with sustainable compounds without compromising quality, Sirmax has been relying on extruders from Coperion GmbH in Stuttgart for many years. Today, the company operates a total of 61 extruders at its 13 production sites, almost all of them from Coperion. These are twin-screw extruders with diameters between 26 and 92 mm, which are used both in production and in the five R&D laboratories. Leonardo Forner describes why Sirmax relies on the extruders from Germany as follows: "Due to our enormous growth, it has been necessary since 2000 at the latest to have an extruder supplier who is internationally active just like us and can support us in all countries with spare parts and service." In addition, he says, they are very convinced of the Coperion technology and can easily produce all compounds, whether based on recyclates or from bio-based plastics made from starch, polylactic acid (PLA) or polybutylene succinate (PBS).

For its latest order, Sirmax opted for two Fast Track ZSK extruders. With these, Coperion guaranteed a fast delivery time of only five months, which also worked out for Sirmax. At present, these delivery times cannot be maintained due to the current material shortages, but nevertheless "we deliver the Fast Track extruders faster than conventional ones in order to enable our customers to achieve a rapid return on investment (ROI)," reports Coperion. According to the machine manufacturer, the shorter delivery times are due to extensive internal and external process adjustments.

Nevertheless, the extruders are exclusively made of proven, high-quality components. They include, for example, the well-known high-performance drive, high-quality materials for the process section and the process engineering know-how from Stuttgart.

www.sirmax.com

"In international comparison, Germany is way too far behind in the implementation of digital technologies".

Prof. Dr.-Ing. Christian Hopmann sees productivity, growth and resilience of companies and the circularity of the plastics industry as areas of success in digitalisation

Prof. Dr.-Ing. Christian Hopmann, head of the Institute of Plastics Processing (IKV) and holder of the Chair of Plastics Processing at RWTH Aachen University.

All photos: IKV

The K 2022 Scientific Council comprises eight university professors. The expert panel supports Messe Düsseldorf in implementing the guiding themes of resource conservation, energy transition and climate neutrality at the trade fair in mid-October. K-PROFI asks the individual professors about their heartfelt topics, their view of the World Fair and about their wishes, especially for the plastics processing industry. Prof. Dr.-Ing. Christian Hopmann, head of the Institute of Plastics Processing (IKV) and holder of the Chair of Plastics Processing in the Faculty of Mechanical Engineering at RWTH Aachen University, takes part in the current interview.

K-PROFI: Which current topics are close to your heart?

Prof. Dr.-Ing. Christian Hopmann: Our entire industry - not only the plastics industry - is being enormously challenged by the justifiably high expectations of climate and environmental protection. At the same time, it is hampered in its competitiveness because it is essentially based on global supply chains that are currently significantly disrupted. At present, we are experiencing massive shifts in these two dimensions, which are also accompanied by serious demographic changes. In short, we are facing major changes that will take place quickly and lead to an uncertain future. We must react to this.

In IKV's research, digitisation has been at the centre of activities for years. The improvement and expansion of simulation techniques are just as much a part of this as the digital upgrading of our machines, plants, and factories. A wave of automation will roll through the factories, if only to compensate for the lack of labour. In the future, these will be fully networked and digital and generate large amounts of data. Artificial intelligence will play an important role in this and in the re-organisation of supply chains, but it is only one facet of digitalisation. The keyboard of digitalisation is much broader, and only those who can play it have a future.

We have shown in our work that digitalisation enables the control of existing processes as well as automatic process set-up - for example in injection moulding. We have significantly reduced the sensitivity of processing operations to fluctuating material properties, such as those associated with post-consumer waste in particular. We have digitally linked the simulation and the real process and have been able to show that both the simulation and the real process improve as a result. In more recent work, we have shown that the circular economy absolutely requires a digital value chain. We made all this clear at our IKV colloquium in early September.

So, although we are researching many topics at the IKV, digitalisation is the central key to solving major tasks for the future, and for this reason it is a matter close to my heart.

Why should the plastics industry, especially the processing companies, concern themselves with your heartfelt topic? What concrete benefits do you see in this? As a scientist, what ideas would you like to see from the manufacturing industry?

There are two levels of answer to this question. Firstly, both the productivity of the company and its growth depend directly on digitalisation. It can compensate for a lack of personnel, curb material

waste and rejects, reduce energy consumption - in other words, everything that has long been one of the almost classic areas of success in digitisation.

Secondly, however - and this is something that will affect us in many ways in the coming years - digitalisation improves the resilience of companies and their ability to act in the event of unexpected events. Artificial intelligence cannot foresee a Covid 19 crisis, flooding events or wars, nor can it predict their impact, because the training data simply does not map such scenarios. Nevertheless, digitalisation helps to manage such crises by improving the robustness of supply chains and processes and enabling if-then analyses. Combining artificial intelligence with human intelligence allows different scenarios to be played out and impacts to be modelled. We call this hybrid intelligence, which is essential for such disruptive events and helps us make smart decisions in an uncertain world.

Last but not least, our plastics economy will not become recyclable without digitalisation: Packaging design must ensure maximum recyclability with low material use and maximum performance. Products and processes must become more tolerant of greater variability in the properties of recycled plastics. In addition, consumers need to be involved in the circular economy processes by informing them about the packaging and how to recycle it correctly. All this cannot be done without digitalisation.

In your opinion, what urgent task is plastics processing paying too little attention to across the board? And what need for action can be derived from this?

Sustainability and climate protection are currently dominating the discussion. That is good and right, but not sufficient. To the same extent that improvements are needed here, competitiveness must also be increased, and digital technologies play a role in all these fields. We need digitalisation like we need electricity, water and other operating materials. In our industry, however, I still do not see a consistent and coherent digitalisation strategy in many cases. There are beacons, but this area of the future receives far too little attention across the board. Digitalisation cannot be implemented in the blink of an eye, which is why early entry is just as important as the consistent development of one's own competencies - not least in order to be able to assess and guarantee data security. It would be really desirable if data security were understood as a dimension of a digitalisation strategy instead of being used as an excuse for inaction. We must admit that Germany is way too far behind in international comparison with regard to the implementation of digital technologies. Something must finally happen!

What do you expect from the next generation of scientists?

Our students have suffered incredibly in the last two years. For four semesters, lecture halls, dining halls and pubs were practically closed, and student life lay idle. With a standard period of study of 10 semesters, that is a very long time, and for all my appreciation of digitalisation, we have seen very clearly that academic study is not productively possible in this way. It requires more than the reproduction of content from textbooks or educational films. In

this respect, we are glad that this phase is over - at least for the time being. We still must overcome the accumulated deficits of that time. Irrespective of this, the breadth of education and its interdisciplinarity is clearly increasing.

In addition to mathematics, thermodynamics and mechanics, the digital armoury, e.g., numerical mathematics and computer science as well as simulation and modelling technology, is already part of the standard. On this secure foundation of knowledge, our students network across the boundaries of institutes and faculties. The formerly quite linear study programme is becoming more diverse. On the one hand, this is of course very welcome, because in a networked world, domain knowledge is not enough.

On the other hand, however, the critical view and the ability to judge in one's own domain must not be diminished. This is an enormous challenge for our students. The already demanding studies will become even more challenging, but also more exciting and varied. At present, not all universities are finding enough new enrolments, but we have a generation of very motivated and committed students in the lecture halls. That gives us courage and pleasure.

Corona or no Corona: What will make the K Fair unique again in 2022? What inspiration, what insights and what signals are you hoping for?

First of all, I am looking forward to the fact that we can come together again, exchange ideas and inspire each other. K deserves special attention this year in two respects: it is still THE leading trade fair for innovations in the plastics industry, and in this respect, we can expect numerous new ideas and innovative products. In addition, the big topic of sustainability will be in the spotlight this year at the special show, the Science Campus and among many exhibitors. We will experience a spirit of optimism here, which we urgently need in order to successfully master the future of our industry.

In this respect, we can look forward to K 2022 because it will once again, and probably much more strongly than ever before, send the signal that the plastics industry is alive, agile, and innovative. Because it makes it clear that the industry is setting itself up for the long term and has a great future if it takes on its challenges and successfully masters them.

www.ikv-aachen.de
www.ikv-kolloquium.de
www.k-online.de

Manfred Stanek, CEO of Greiner-Packaging, pleads for a balance between the absolutely necessary in packaging and a potential renunciation.

Balancing act between sustainability and consumption?

Greiner Packaging CEO Manfred Stanek sees the onus above all on the distributors.

"Are we blind?" This was the provocative question posed by Prof. Helmut Maurer, Waste Management & Recycling Unit of the Directorate General of the EU in Brussels. In his lecture on the occasion of the Innovation Day of Greiner Packaging, he urged both the plastics industry and every individual to reduce the CO_2 footprint and promote climate protection. The topics have long been on everyone's lips and were also in the foreground during the entire event, which was attended by 100 guests at Packworld in Oberwaltersdorf, Austria. K-PROFI had the opportunity to talk to CEO Manfred Stanek about the goals of the packaging manufacturer itself. In the interview he explained which objectives his company, which now employs around 5,000 people and achieved a turnover of EUR 772 million last year, is pursuing. How can the balancing act between sustainability and consumption be managed, what can each individual contribute and what can a large company like Greiner Packaging do?

K-PROFI: As the managing director of a large packaging manufacturer, what is your main concern at the moment?

Manfred Stanek: For the plastics industry and thus for us as part of this industry, there are currently many issues, but the most important one is certainly climate neutrality. On the one hand, we need packaging that protects packaged goods, especially food, from spoiling; on the other hand, it is precisely this packaging that is under criticism.

But despite this, it is precisely the packaging industry that is experiencing significant growth?

Yes, that is true. The global megatrends are pushing our industry. These include the worldwide growth of the overall population, the growth of the middle class, the desire for more flexibility and mobility as well as increasing individualisation. With the right business plan, the industry cannot escape growth in the least.

And you want to grow?

Of course, we want to continue to grow as a company and we are trying to do this organically on the one hand by developing new products and expanding our product range and on the other hand through acquisitions.

How does this fit in with the idea of sustainability?

Our corporate goal is clear: we want to participate in the growth, after all we have a responsibility towards our employees. This in turn is precisely one of the reasons why we must master the balancing act between growth and sustainability.

And how?

All our products are constantly put to the test. Especially here in the more developed countries, we all must reduce consumption together in order to act more sustainably. Packaging is already part of the solution,

Manfred Stanek in conversation with K-PROFI editor Karin Regel.

after all, it protects the packaged goods from spoiling and prevents them from having to be thrown away. But reducing consumption also means developing lighter packaging and thus saving material. After all, our industry is measured by its consumption of plastics. And this in turn can be reduced by using recycled goods.

Do you already use recycled goods and what is Greiner's long-term goal?

Our goal is to use 30 % recycled material in all our products by 2025. We already use recycled materials, but not in all products and not in sufficient quantities. The problems here are, on the one hand, the availability and, on the other hand, the very strict regulations that currently prohibit the use of recycled materials for packaging that comes into contact with food.

What changes would you like to see in this context?

We process countless tonnes of material per year. Of the total amount, about 60 % is PP, 25 % PS and 15 % PET. As you can see, PET has the smallest share in our company, but in the industry it is precisely the material for which there are already established recycling cycles.

Moreover, r-PET is approved for food contact. But why is r-PET more expensive than virgin material today, that's not fair to the consumer. And why does a large part of the recycled material end up in non-food applications? In my opinion, post-consumer material from the food industry should stay in it!

What do you mean by saying that the higher price for r-PET is not fair to the consumer?

We businesses and the legislation have the responsibility to inform the consumer well on the one hand, but also to relieve costs on the other hand. Right now, many consumers are struggling with 8% inflation and don't even have the choice or the time or ability to look at sustainable packaging solutions. We need to design packaging that is affordable for everyone and does the least damage to the environment.

But it is precisely the consumer who is seen in many debates as playing a key role in connection with collection rates and recycling possibilities.

Of course, it would be ideal if every consumer did his or her part to make the packaging industry more sustainable. But in my opinion, this is the wrong approach. We, as well as the distributors, must do our job and make it as easy as possible for the consumer to participate in the sustainability goals related to packaging.

For example?

A good example is our yoghurt cup with a paper sleeve. Previously, this was only correctly disposed of if the consumer detached the paper sleeve from the plastic cup and disposed of both materials separately in the bins provided. If the two materials were not separated, the cup was lost for recycling. Research has shown that we have failed to reach around 75% of consumers despite instructions on the packaging. That is why we have developed our packaging system in such a way that paper and plastic separate from each other in the reprocessing plant, thus relieving the consumer.

Why do you use this combination of materials at all? Isn't the trend more towards mono-material solutions?

You are absolutely right. The future belongs to monomaterial solutions. However, it is precisely these yoghurt pots with paper sleeves that are in great demand, because in many cases they are the most sustainable option in terms of plastic consumption and CO_2 emissions. Another advantage is that a plastic cup can easily "hide" under the paper band, which is made of recycled material and therefore may not be perfectly white.

What other measures is Greiner pursuing to act more sustainably?

Reducing consumption also means reducing the use of materials. And that is exactly one of our goals. We are working on making

packaging lighter and lighter without losing functionality. At the same time, we are reducing imprints and using more water-soluble inks; these are easier to remove during reprocessing, which in turn leads to a higher-quality recyclate.

You said that it is difficult to get hold of recycled goods at all, as they are not only expensive but also hardly available.

Yes, that is also true. That is why we work very systematically with partner companies to secure material flows for us and, on the other hand, to further develop and establish recycling processes.

Does this mean that Greiner will integrate backwards in the future and process its own material?

I can't rule it out, but at the moment we are still far away from that. In principle, Greiner is open to acquisitions, as already mentioned. However, a lot of know-how is required for the processing of post-consumer residues for renewed food contact and that is why we are happy to rely on and work with experienced partner companies.

Speaking of food contact. We already talked about r-PET and its use in food contact, what is the situation with the other two materials you use, PP and PS?

Unfortunately, we have not yet succeeded in establishing closed loops for renewed food contact. But I am absolutely sure that this will change in the near future. What is already possible and what we are doing is using recycled material in the middle layer of a mono-material composite. For example, we combine the use of recycled material with monomaterial solutions for food contact. We also use r-PP with a share of up to 100 % for the production of non-food packaging and use it, for example, to produce a container for dishwasher tabs for Henkel.

One last question: Do you believe that Professor Maurer is right, that we are blind and that the ship has sailed for more sustainability and a reduction of the CO_2 footprint?

No! If I really believed that I would no longer be able to do my job and I would also have done it wrong lately. He is right that it is high time for change, but in my opinion this can only happen step by step. Sustainability has many facets that we all must take into account. We need to reduce consumption and move towards consuming only what is naturally available. We have to find a balance between the absolutely necessary and a potential renunciation, and we have to create transformation in many areas. And everyone is called upon to do this, the legislators, the companies and the consumers. Unfortunately, some opportunities have been missed by industry in the past - I agree with Mr Maurer. All companies involved along the value chain must find new sustainable solutions as quickly as possible. No one should rest on the assumption that someone else will come up with the ground-breaking solution. No company - but also no individual - should avoid the responsibility to do his or her best to reduce the CO_2 footprint as quickly as possible. So, I can certainly see something in Mr Maurer's statement. In my thoughts and actions, however, I focus strongly on what is still possible and on the positive changes that are sure to come.

The interview was conducted by K-PROFI editor Dipl.-Ing. (FH) Karin Regel.

www.greiner-gpi.com

Quality instead of quota for recycled plastics

Why through-coloured compounds can be superior in premium applications

All photos: K-PROFI/Hauptmann

Left: Managing Director Michael Trapp: "Politics must not prescribe an alternative solution for the use of raw materials, we need openness for the technical solution."

Below: Sattler works exclusively with colourants in powder form, which are weighed in strictly according to the recipe for each batch individually.

"We guarantee the colour and technical specification of our compounds," is how Michael Trapp sums up the special expertise of his company, which produces through-coloured technical thermoplastic compounds for high-quality niche applications. Above all, manufacturers of visible parts for house and building technology such as switch programmes, lights, door intercoms, heat meters, but also manufacturers of high-quality writing utensils as well as medical devices have been relying on the high granulate quality of Sattler KunststoffWerk GmbH in Mühlheim am Main for years. In an interview with K-PROFI, Managing Director Michael Trapp explains why it is completely irrelevant that secondary raw materials are used, how his company guarantees colour accuracy and why he tends to advise against masterbatch for these specific applications.

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

A customer-specific order that leaves the Sattler KunststoffWerk ranges from a granulate bag of 25 kg to a truck load of around 23 t. "We always produce on an order-by-order basis. If we have a master agreement with a customer, then we also store a defined quantity of compound," says Michael Trapp, explaining the approach of his company, which employs around 30 people. To produce its annual 2,500 t, the production hall is equipped with six co-rotating, 32 D long twin-screw extruders with vacuum degassing from Noris Plastic GmbH & Co. KG, Altdorf, Feddem GmbH & Co. KG, Sinzig, and Leistritz Extrusionstechnik GmbH, Nuremberg. All lines are equipped with strand pelletising units from ips GmbH & Co. KG from Großostheim.

"Our lines run around the clock and, of course, have to be changed over frequently to meet a wide range and different customer requirements." Good production preparation, which is adjusted almost daily to customer requests and raw material availability, is a must. "The worst colour change is from dark green to white translucent. It takes longer than one shift to really remove all material and colour residues in the system components and be able to produce a colour-precise product again," Michael Trapp reports from everyday production. But such changeovers are rare. Most of the time, one line is used for the same colour family and is run in a colour-similar way, with one line being used for the darker and one for the lighter formulations.

Secondary raw materials, of course

The base materials for the special compounds, to which not only the colours but also additives such as antioxidants, demoulding aids, UV protection or flame retardants, germicidal additives, laser-sensitive pigments, and impact modifiers are added, are technical thermoplastics. "We process all engineering thermoplastics except PVC from our focus materials PC and PC/ABS to PMMA, PA as well as POM and PET," Michael Trapp continues, noting, "It all started with ABS in 1965." His predecessor and company founder Edmund Kurt Sattler initially started in Offenbach am Main. In 1982, the company moved to its current location in Mühlheim am Main. He, too, was already producing custom-dyed compounds and working with twin-screw extrusion lines. It was also he who used secondary raw materials to produce his granulates even back then. And so it has remained to this day. "We use every suitable input material we can get. This includes true-to-type and non-true-to-type goods from raw material producers as well as regranulates and regrinds, which we regularly buy from selected processors. The only thing that counts is the end product that we can produce from it. We make no compromises here, and our long-standing customers know that."

Being open to technical solutions

When asked how high the recyclate percentage is in his compounds, Michael Trapp answers very clearly: "We are not concerned with quotas, but with quality. The customer doesn't have to be concerned with the

recycled content of the colour compounds he buys from us, as long as we meet his technical specifications." After all, Sattler has been processing secondary raw materials not just since there have been political demands for increased use of recyclates, but always. Obviously, it is in his interest to act economically and sustainably: "For us, the customer's material is always in the foreground. To this end, we process exactly the input material that is suitable, irrespective of political demands."

With regard to the current discussion in the market and the political regulations, his assessment is also very clear: "If politics prescribes a technical solution without an alternative, this must lead to a dead end. Companies need openness for the technical solution." There are already sufficient requirements: since 2002, there has been a landfill ban for plastics in the Technical Instructions on Municipal Solid Waste (TA Siedlungsabfälle), the take-back requirement for distributors of products in the Closed Substance Cycle Waste Management Act (Kreislaufwirtschaftsgesetz, KrWG) and the export ban for waste that is difficult to recycle, mixed or contaminated. "If these three requirements are implemented consistently, we no longer need to discuss quotas. The material use of recycled plastics would then be a question of economic efficiency. It would be the norm – like in our case, because incineration would then be more expensive."

Through-coloured compounds are advantageous

For Sattler, openness to the technical solution means that in the production of compounds that must be transparent or diffusely translucent, secondary raw materials are usually ruled out because of the varying inherent colour. Secondary raw materials are common for muted colours. "And when we use secondary raw materials, we usually use them at 100%," Michael Trapp reveals. For his customers, he says, this is not relevant; what matters to them is the quality and the precise colour. And if a reproducible colour shade is important and rather small quantities are processed, Michael Trapp clearly advises his customers against the use of masterbatch. "For the use of colour concentrates, a manufacturer does give dosage recommendations, but each processor will find out the 'right' dosage for itself and its product and deviate from the recommendations if necessary."

In contrast, he says, processing compounds that have already been dyed through is very simple and safe. "In addition, an injection moulding machine does not have as good a mixing effect as a twin-screw extruder, so there could be inaccuracies when processing particularly small quantities of masterbatch," he names a second reason why he offers his customers through-coloured compounds. And his success proves him right: "Sometimes it takes a while before a customer decides in favour of our through-coloured compounds instead of masterbatch, but once he has made up his mind, he sticks with it. The

Sattler relies exclusively on strand pelletising systems, because they can be used flexibly and are and can be cleaned quickly.

At the site in Mühlheim am Main, there are a total of six twin-screw extrusion lines for the production of through-coloured compounds for high-quality niche applications.

In contrast to masterbatch, through-coloured compounds have the great advantage that they meet the customer's colour specifications reproducibly and precisely.

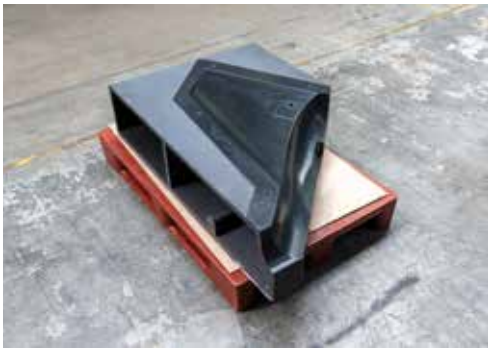
benefits are simply compelling, as evidenced by the number of regular customers we have had for many years."

Guaranteeing colour

Colour is an important feature of many components. "Although we are a relatively small company, we work with two colourists who develop each recipe in-house and coordinate it with the customer," Michael Trapp explains the procedure. For colouring, Sattler only uses colourants in powder form, which are weighed in by the machine and system operator according to the specified dosage instructions and then pre-mixed with the base polymer and other additives in one of the container mixers from Mixaco of Neuenrade. Once a mixture has been processed into pellets via the twin-screw extruder, a sample of it is immediately tested in the laboratory for purity, precise colour and flowability. Only when both correspond exactly to the specification defined in the recipe is the entire order processed. "Since we produce around the clock, the shift supervisors were instructed by the colourists to compensate for even the smallest colour deviations independently," Michael Trapp praises his team.

www.sattlerkunststoffwerk.de

All photos: K-PROFI/Schneider



Left: Only a few minutes later, a clearly recognisable component has already emerged from the first subtle contours.

Barac Bieri is looking to the near future: "In the long term, I want to use the hybrid machine to tackle new ideas that are not even on the radar today."

Printing large components requires a lot of space. The new hybrid press is impossible to miss. In the foreground: moulds for drone wings in various stages of production.

Right: The completed mould: the details have been worked out and the surfaces polished smooth.

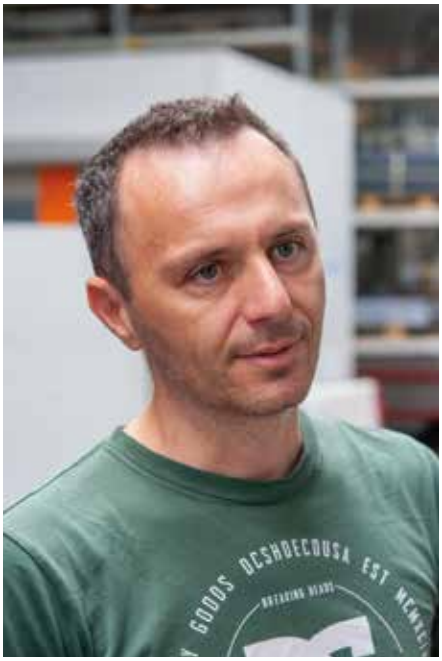
"You can't keep doing the same thing for 30 years"

How the Swissplast Group thermoformer is conquering XXL 3D printing

Producing large moulds for CFRP or GFRP components is time-consuming and expensive. Many work steps are necessary until the mould is completed in the desired polished surface for small series production. And: if the moulds are milled from a GRP block, a lot of material is lost. For large moulds, but also large components, the Swissplast Group at the Ichenhausen site relies on the hybrid machine Kreator from the Italian machine manufacturer CMS in addition to thermoforming, in which the 3D printing of huge moulds and components and their CNC post-processing are married together.

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

Barac Bieri, CEO of the Swissplast Group, is breaking new ground with the machine: "The Kreator has only been here for three weeks. We are currently printing large moulds for GRP components, assembly templates, sample moulds and trimming devices for CNC machining of our deep-drawn components. But in the long term, I want to use the machine to tackle new ideas that aren't even on the radar today." To discover this future, he sounded out projects in July at a first customer day with 20 participants in Ichenhausen. "I was surprised at how high the response and interest in the technology was," says Bieri happily.



Claudio Vimercati is responsible for new technologies and strategy at CMS (top left). Together with his colleague Alessandro Zanardi, Sales Manager at CMS (top right), he is a frequent guest in Ichenhausen. Together with those responsible at Swissplast, they optimise the parameters and operation of the Kreator.

Rapid printing of giant components

The machine owes its existence to a development by the Fraunhofer Institute for Machine Tools and Forming Technology (IWU) in Chemnitz. The researchers have succeeded in increasing the speed of 3D printing by a factor of 8. The basis is Screw Extrusion Additive Manufacturing (SEAM), which the developers at CMS have further developed into a series machine together with IWU. Here, an extruder is installed above a platform that can

be swivelled in six axes and 45° angles. The extruder melts free-flowing plastic granulate and deposits it in layers on the platform via a nozzle at a high output rate of up to 10 kg/h. This is how the previously programmed component is produced. The nozzle diameter can be varied between 2 and 5 mm.

The appeal of the machine also lies in the integrated 5-axis CNC system. Immediately after printing, boreholes can be inserted, surfaces can be machined, and fine details can be worked out. This is how the mould for the wing of a drone made of CFRP was created – the 870 x 640 x 400 mm large and 85 kg heavy mould made of PC-CF20 was printed in eight hours. Satisfied, Bieri explains: "The batch size of the drone wing is not that high. 3D printing of the mould is optimal for such applications in particular. If the mould were produced using the classic method, it would take much longer and be significantly more expensive. We save over three quarters of material and the mould weighs only half." After printing, CNC machining refined the contour and smoothed the surface – a process that took around 20 hours.

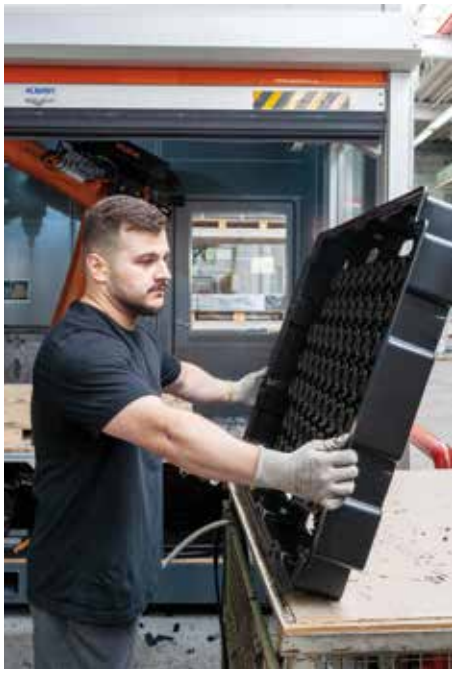
After the mould for the drone wing, the machine continues on seamlessly and prints a trimming device out of a PA6-CF30. This is intended for one of the numerous CNC machines that will process the thermoformed component for a construction machinery manufacturer. It takes about four hours to print the 372 x 450 x 298 mm fixture with a wall thickness of 24 mm, then it is ready for use. From Bieri's point of view, printing the trimming jig has another advantage: "If I need the jig again, I press a button and the machine reproduces it. Because the programme for it is stored and can be called up at any time."

The machine can handle components of up to 1,800 x 2,200 x 800 mm. If the components are smaller, it is possible to move a component to the side to cool it down and already start printing the next part. Printing and milling at the same time is not possible, because the spindle carries either the print head or the milling tools.

Complement to thermoforming

A wide range of materials – filled and unfilled – have so far proved suitable for printing: PA6, PC, PP, ABS, PET, PEI – many other materials are possible. Bieri specifies: "The application determines the material. I don't see the machine as a replacement for our existing

The first layers of the trimming device are being printed.



technology, but as a complement, as an independent field of activity. The machine fits our business of producing large parts. It offers a high degree of design freedom, and we can produce components in the non-visible area in small batches that now have to be manufactured in other processes. In addition, quick turnarounds are possible. For example, if a customer only needs one component or one mould

Across all locations, the Swissplast Group works with 30 thermoforming machines. The UA150 from Illig is brand new in Ichenhausen. The new addition produces workpiece carriers for an automotive supplier. The tray is made from a 1,280 x 885 x 6 mm ABS semi-finished product with 69 workpiece holders, which are formed by an upper die with a drawing depth of about 100 mm. The workpiece trays are removed manually and then provided with four recesses in the CNC machining centre and rounded off at the edges.

for a trade fair, we can produce that within 48 hours. A lot of things are conceivable there." To reflect the possibilities of the new process, Swissplast has created its own brand for the new field of activity: swiss3dprint.

All those involved with the Kreator in Ichenhausen are still in close contact with each other. The CMS developers are frequent guests in Bavaria and test every new application together with the experts at Swissplast. Together, the experts tinker with optimal process parameters, experiment and optimise. Ultimately, everyone must grow into the new technology and the responsible employees at Swissplast have to acquire the necessary know-how through courses and on-the-job training in order to be able to survive as pioneers of the new process. "We spend a lot of time developing and optimising the process, because after all we are the first in the German-speaking countries to work with the new machine," Bieri affirms. According to CMS, there are only a few machines in use so far: in addition to the one at Swissplast, one in Italy and in the UK, and others are in production. Alessandro Zanardi, Sales Manager Germany at CMS, describes the status quo: "We are constantly developing the technology together with Fraunhofer IWU and incorporate the experience of our customers. This successful cooperation enables the technical progress of the machine."

Core business thermoforming

In Ichenhausen, however, it is not only the Kreator that is a new addition; a UA150 thermoforming machine from Illig with automatic sheet loading has only been around for a few weeks. It produces workpiece carriers, pallets, system solutions and even trailer wheel runners. While touring the production line, the machine produces a workpiece carrier for components of an automotive supplier. The tray is made from a 1,280 x 885 x 6 mm ABS semi-finished product with 69 workpiece holders, which are formed by an upper die with a drawing depth of about 100 mm. The component is removed manually and then provided with four recesses in the CNC processing machine and rounded off at the edges.

Thermoforming is the core business of the Swissplast Group. At its Swiss and three German sites, 200 employees produce interior linings for trucks, trains, and caravans, as well as covers for construction machinery, workpiece carriers and blister packs. In the first half of 2022, the group achieved a turnover of EUR 18 million. 80 people work in Ichenhausen. Bieri has invested heavily here since the takeover in 2018: "There was already an investment backlog in the plant before the takeover. We have invested more than EUR 2 million in new machines since then." Across all sites, 30 thermoforming machines and 20 five-axis CNC machining centres are in use.

Not only is the entire production CO_2-neutral, but all products – from raw material extraction to the customer, including recycling. Investments in climate protection projects around the globe are just as responsible for this as a photovoltaic system. It will be installed in Ichenhausen in September and cover 30 % of the electricity needs there. Another system is planned for the Gotha plant. The modernisation of the machinery and optimised processes are another important pillar for efficient and climate-friendly production. Modernisation and venturing into new technologies such as 3D printing of XXL components are part of Bieri's philosophy: "You can't always just do what you've been doing for 30 years. We must dare if we want to evolve!"

www.swissplast.com; www.swiss3dprint.com

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Mediocrity brings mediocrity

Instead of strengthening strengths and thus bringing out the best possible in personalities and also systems, we tend to keep on equalising. This is reflected in schools, in teaching and research politics, but ultimately also in industry.

If a child is very good at maths and physics, but mediocre in other subjects, people regularly try to bring the child up to a higher level "overall" by promoting precisely these subjects. The result is often that the child becomes minimally better in the weaker subjects but drops to an average level in the supposedly strong subjects, because no more attention is paid to these "already" strong subjects. This creates mediocrity, although top performance would be expected in certain areas.

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Something similar is currently happening in research politics. On the one hand, in order not to lose important votes, attempts are being made to distribute research funds equally to all universities. Unfortunately, for years now, the money for research and teaching has not grown proportionally with the needs of the (newly) emerging universities of applied sciences, polytechnics, but also university institutes. As a result, all are being funded, but the top ones less and less. And especially in the engineering sciences, it would be important for sustainable application-oriented top-level research to provide proper funding for a few.

In the search for money, we have once again seen stylistic blunders from our administration in recent months. The meticulously pursued so-called "prohibition of betterment" and "freedom of science law" should lead to all scientists being paid equally well (or poorly). However, if one wants to attract top researchers or managers from industry to research and teaching, the pay they receive looks absolutely unattractive. If the regulations are consistently enforced, skilled researchers will leave the universities or will not be recruited in the first place. Especially in this day and age, it should be clear to everyone that we need this research and networks in order to restore Germany's future and innovative capacity as a business location.

Interestingly, the Fraunhofer Institutes, which are heavily funded by the state, and also the Max Planck Society, for example, are not affected by this egalitarianism, but the institutions of the Zuse Association and other rather independent ones are. I am of the opinion that this counterproductive trend should be stopped as soon as possible, so that all those affected are not preoccupied with administrative hurdles and bureaucracy, but with achieving high-quality research results.

More and more new rules and regulations lead to paralysis in the industry as well. When you see how many employees nowadays are only concerned with complying with ever new (partly self-made) rules, preparing themselves and others for ever more elaborate audits and other controls, the question must be allowed as to who benefits from this in the end. Such routines also lead to top managers no longer having the desire to propose and implement new things if innovation is regulated away.

The result is interchangeable, unmotivated mediocrity.

The next issue of K-PROFI international will be published at the end of 2022.

Imprint

K-PROFI international – Inspiration for plastics processors

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Saalburgstr. 157, 61350 Bad Homburg, Germany
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Subscription
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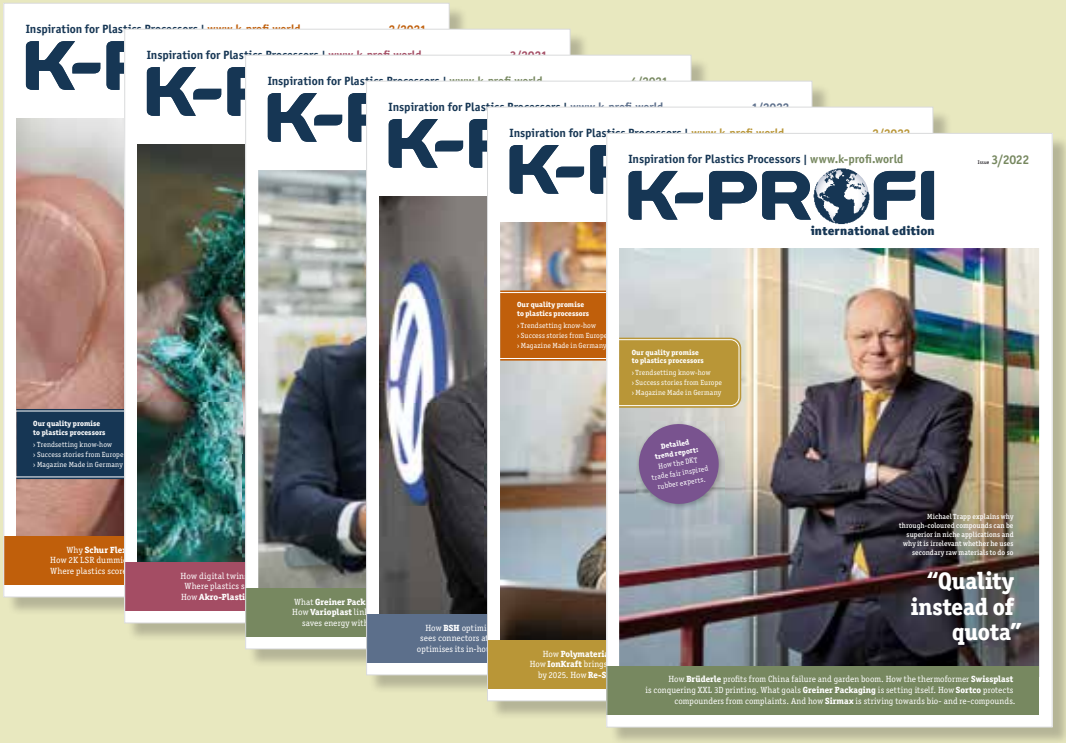

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