

# Injection

The magazine from ENGEL for the plastics industry

April | 2020



**"Scouting for new possibilities,  
new technologies"**

ENGEL Techtalk discusses foil solutions  
for sophisticated surfaces

**page 14**

**ENGEL presents next generation e-cap**

Highest stability and precision  
with the shortest cycle times

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**Far more than pick and place**

ENGEL viper linear robot ensures great  
competitive edge at Steinbach

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## World class with tie-bar-less machines

Cover story: Peštan, Serbia, relies on ENGEL victory

page 4



**ENGEL**  
be the first



**Dr. Stefan Engleder**  
CEO ENGEL Holding

### **Stability – even in uncertain times**

Never before has the editorial for the Injection magazine been written under such exceptional circumstances as in this issue. A new virus is spreading across the globe, confronting all of us with major challenges and making the future highly uncertain. This uncertainty raises many questions – for you, for ENGEL, for all of us. Despite this, our aim with this issue of Injection is to give you a piece of your everyday life, a life that we are hopefully able to live together again soon.

On page 14 you will find our Techtalk about the transformation of the automobile. Whatever direction it takes, plastics and injection moulding processes will always play key roles because of their efficiency. In the success stories relating to Peštan, Georg Utz and Steinbach on pages 4, 24 and 28, you can discover how important good teamwork is for successful projects. Let us not lose sight of these aspects so that we can continue to build on them after the pandemic is over.

Team spirit is particularly evident in times like these, and we are all growing with the new challenges we face. Many ENGEL employees are working from home. Our customer service is still up and running and in both cases – but under new rules, of course – maximum commitment and flexibility are more important than ever. For example, to ramp up the production of urgently needed medical products in the shortest possible time.

The world as we know it is changing fundamentally – but ENGEL is and will remain a reliable partner for you throughout all these changes. Our passion for injection moulding is strong as ever, we are well positioned and prepared for times of crisis. Especially now, we will continue to invest in the development of new products and technologies. It is important to us to provide you, dear customers, with the best possible support in times like these.

We offer you stability – even in uncertain times.

Best regards and stay healthy!

### **IMPRINT**

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# World class

## with tie-bar-less machines

To make sure that the neighbours can continue sleeping peacefully despite somebody taking a bath or flushing their toilet in the middle of the night, sound-insulated pipes and pipe fittings are increasingly being installed in new buildings. S-Line is Peštan's response to this trend. The S stands for silent and promises building drainage hardware that performs at less than 12 decibels. The pipe system specialist based in Aranjelovac, Serbia, 75 kilometres south of Belgrade, modernised its injection moulding production for the market launch of the innovative product line two years ago. The new tie-bar-less ENGEL victory machines make it possible to meet the increased precision requirements while maintaining low unit costs.

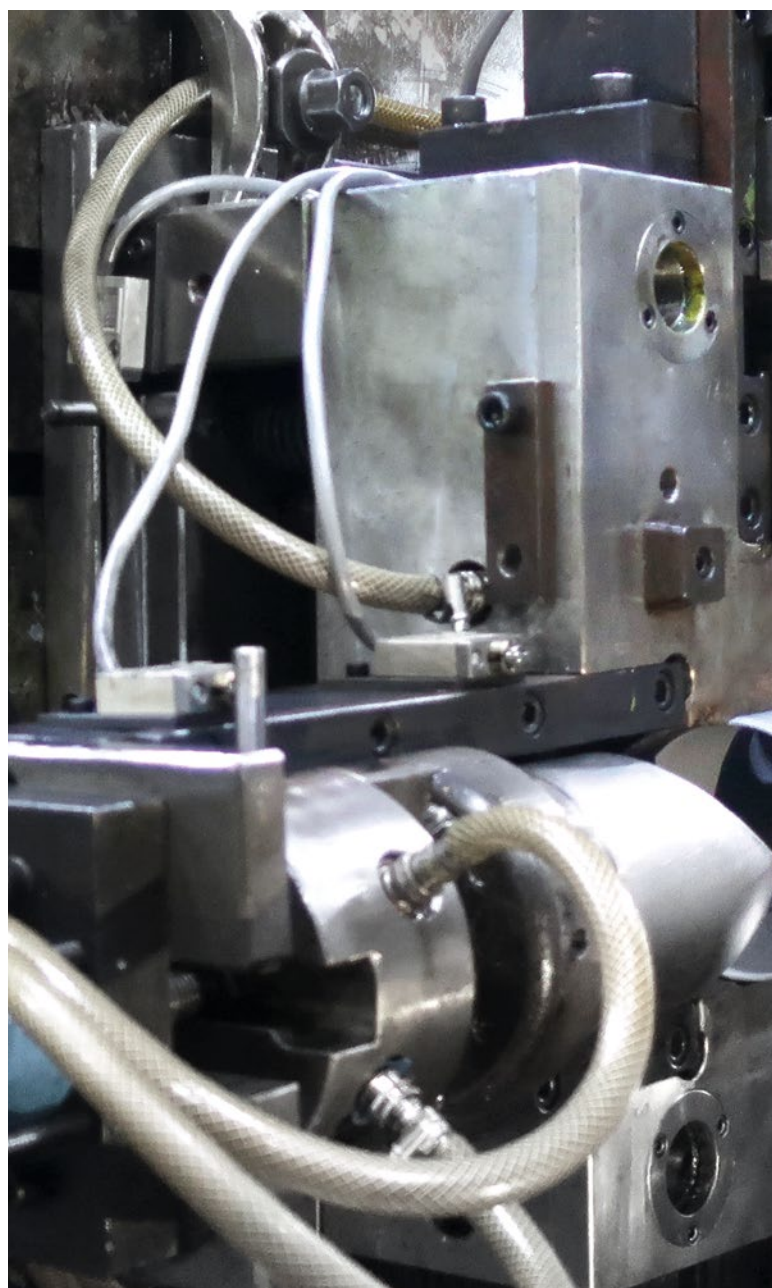


"We are the largest production plant for pipe and pipe fittings in Europe," proudly says Miodrag Petkovic on a tour of the production facility. He manages the company founded by his father 30 years ago, which in itself is a good customer of the products they produce. The new administration building has almost been completed and the production floors are also being extended. The location employs more than 1000 staff.

Injection moulding and extrusion are the two major production processes that produce parts with a total material weight of 65,000 tons per year. After completing the plant expansion, the capacity will grow to 100,000 tons per year. "We are responding to rising demand, also from abroad," says Petkovic. Seventy percent is exported, primarily to Europe, but also to the USA and Asia. Thirty percent remains in the countries of former Yugoslavia, where Peštan is a leading brand.

### Focus on operating costs and availability

Innovative products, such as low-noise pipes and pipe fittings, are among the growth drivers. The S-Line range currently accounts for around eight percent of the business. "This business will grow to at least thirty percent over the next five years," says Petkovic. "We have invested heavily in sound insulation," as Milan Nikolić, Head of Strategic Development at Peštan, emphasises. There is a lot of expertise in the material – it's a mineral-filled polypropylene – and also in the geometry of the fittings.



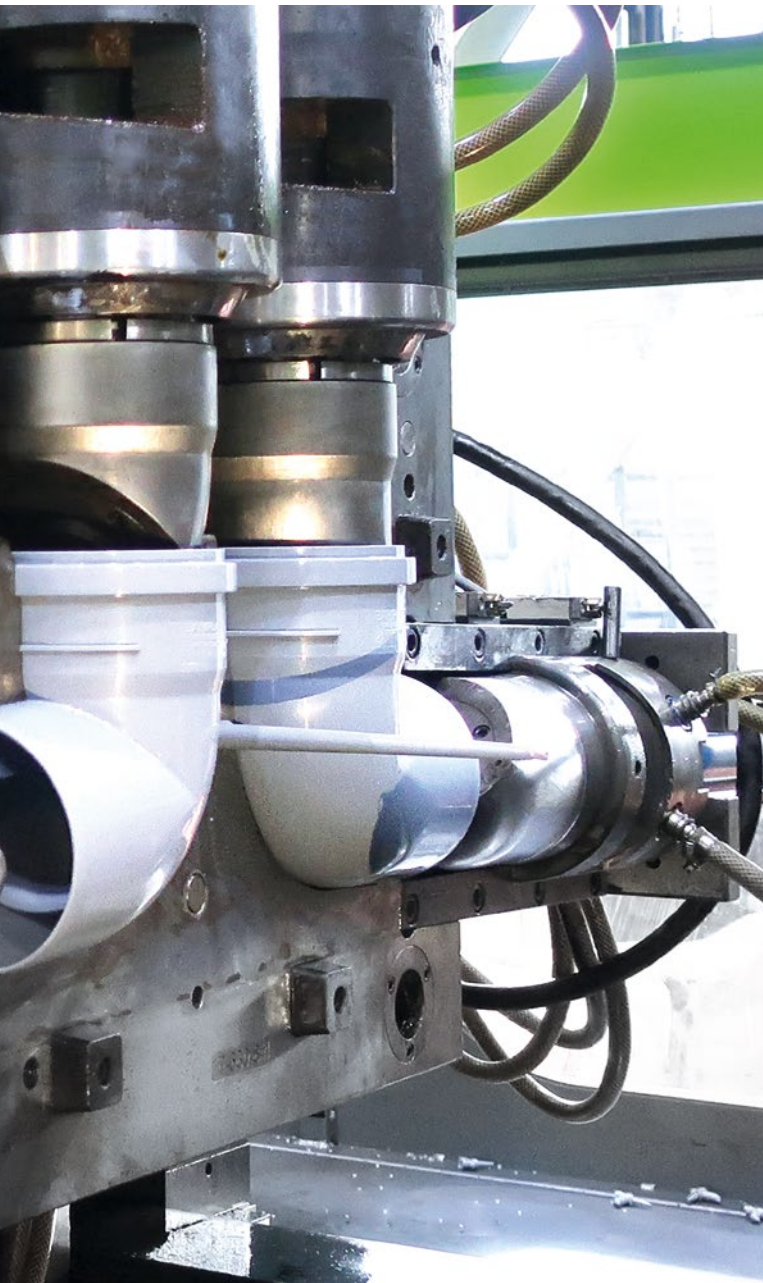




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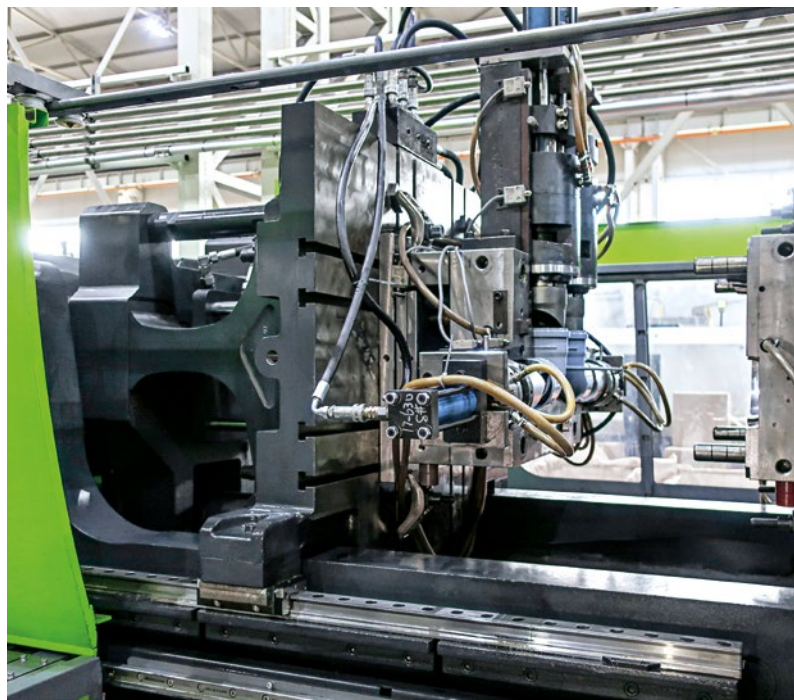
When customers visit us, they are always impressed by our production. ENGEL is also a respected brand among our customers.”

*Miodrag Petkovic, CEO of Peštan*



"The material and geometry place significantly higher demands on the injection moulding process than conventional pipe fittings," says Nikolić explaining why the company also invested in machinery.

The majority of the more than 100 injection moulding machines at the location still come from a Chinese supplier. "The investment costs were the deciding factor for us for a long time," says Petkovic. "But the criteria have changed. Operating costs and machine availability are more in focus today." S-line pipe fittings and other sophisticated products are now in production on 18 new ENGEL victory machines with a clamping force range from 2600 to 5000 kN, some equipped



*If the cavities are in the area of the mould mounting platens, the core-pull mechanism can project extend the edge of the platen.*



with integrated ENGEL viper linear robots. Ultimately, tie-bar-less technology tipped the decision in ENGEL's favour. "We had our eye on tie-bar-less machines for a long time. On top of this, we wanted the best possible technology," says Petkovic. It was also clear that the higher capital investment would have to pay off in the end. As expected, this is mainly due to the far faster setup processes. The bottom line shows that other properties of the ENGEL victory machines also reduce unit costs.

### Setup times cut in half

The huge mould inventory is particularly impressive during the tour of the plant in Aranjelovac. 7000 moulds are in active use. With a minimum run time of two days, specified by plant planning for large moulds, at least 15 set-ups are carried out per week. A look at the running machines clearly shows why mould set-up is an essential factor in pipe fitting production. Pipe fitting moulds cannot do without core-pulls, and often these protrude laterally beyond the mould. "Pipe fitting moulds are extremely large and complex compared to the part surface to be created," says Franz Pressl, Product Manager for victory machines at ENGEL's headquarters in Austria. "Injection moulding machines with a tie-bar-less clamping unit are perfectly designed for this." The moulds can be loaded into the barrier-free mould area in one piece and mounted directly from the side of the machine. "We don't need more than an hour and a half to set up even the most complex moulds," says Nikolić, pointing out the benefits. "Mounting the same mould on a machine with tie bars would take three hours, because we first have to dismantle the core-pulls, and every minute of downtime costs us money. With ENGEL machines, we achieve utilisation times of over 90 percent. That's a very high value that directly affects the unit cost."

The significantly smaller machines are another efficiency factor. Since the core-pulls cannot always extend between the tie-bars, many pipe fitting moulds run on larger tonnage machines than are truly required for the process. This is different with tie-bar-less machines. "Only the cavities have to be in the area of the mould mounting platens," as Pressl explains. "But the mould edge and the mechanical system can protrude beyond the platens." This means that large moulds fit on comparatively small injection moulding machines that require less energy, coolant and floor space. "During the purchasing process, it is usual to compare machines with the same clamping force," Nikolić knows. "We have now explained to our procurement department that this does not hold true for the victory machines. The basis of comparison for a 300 ton tie-bar-less machine is an 800 ton machine with tie bars."



*18 ENGEL victory machines are available at the plant for the production of sophisticated moulded parts.*



*Even with complex moulds, the clamping force required for the moulding process and not the mould dimensions determines the size of the injection moulding machine used.*



## Plasticising consistency reduces raw material consumption

Before deciding on ENGEL and tie-bar-less technology, Peštan visited customers using ENGEL victory machines, and, with the support of Neofyton, ENGEL's sales partner in Serbia, took a mould for testing to another ENGEL customer. "We received very good advice from ENGEL and Neofyton right from the start," reports Petkovic. "The victory machines were designed with a special mixing head specifically for our special compound." A further central key topic in the planning of the system was precise injection control, as S-Line pipe fittings can quickly exhibit light spots at the injection point. "The victory machines help us to achieve very high repeatability, which allows us to operate at faster speeds," as Nikolić emphasises. "Additionally, we have been able to reduce the use of raw materials by five percent because of our plasticising precision."

Parallel to modernising the machinery, Peštan launched an extensive Lean and World Class Manufacturing (WCM) project. The investment in ENGEL machines set an important, initial milestone on the way to WCM. "When customers visit us, they are always impressed by our production," says Petkovic. "ENGEL is also a respected brand among our customers."

Partners Peštan and ENGEL also have some plans for the future. "ENGEL not only has a huge amount of experience in injection moulding, but also very good insights into future trends," says Nikolić. He has his sights firmly set on process integration and multi-component injection moulding. For example, seals will be injected directly into the fitting thread in two-component injection moulding in future, immediately before the barcode is automatically printed. Tie-bar-less victory machines have already been designated for this task. After all, multi-component processes and the integration of upstream and downstream steps can also be implemented far more easily and efficiently thanks to free access to the mould area.



From right to left: Milan Nikolić and Miodrag Petkovic from Peštan, Franz Pressl from ENGEL and Dusan Bunovic from Neofyton.

## One thing in common: 30 years

The same year Peštan was founded, 1989, ENGEL introduced the world's first injection moulding machine with an accessible, tie-bar-less clamping unit. The industry showed high interest soon and the tie-bar-less machine became the predominant design at ENGEL's main production plant in Schwertberg, Austria. Because of its victorious triumph, it was given the name victory. ENGEL now offers three tie-bar-less machine series, the servo-hydraulic victory, the e-victory with an electric injection unit and the all-electric e-motion TL. All of them combine excellent cost-effectiveness and efficiency with maximum resource protection.



# ENGEL worldwide. Where you are.

## Paul Caprio joins ENGEL North America's leadership team



Paul Caprio (left) and Mark Sankovitch (right)  
to lead ENGEL North America.

With the beginning of the new year, ENGEL North America based in PA, USA, welcomed Paul Caprio as president. Together with Mark Sankovitch, CEO of ENGEL North America, he manages the sales and service subsidiary. "We are very pleased to have Paul Caprio join ENGEL", states Dr. Christoph Steger, CSO of ENGEL Holding, Austria. "He brings extensive experience that will only add to our successful team in the US and Canada." Paul Caprio is serving the plastics industry for the past 30 years in the machinery market. "I'm excited to be working for ENGEL," comments Caprio. "A company that is known for its overall leadership position and cutting-edge technical advancements in the global machinery market. I am also incredibly impressed with the knowledge of the global management team as it pertains to customers and the day-to-day challenges they face in the marketplace". Mark Sankovitch has been the president and CEO of ENGEL North America since 2009 and continues a leading role as CEO of North America with the plan to retire end of 2021. "It is a privilege to have two such industry experts like Mark Sankovitch and Paul Caprio work together for two years," says Steger. "We can therefore guarantee a high degree of continuity for both employees and customers in North America."

## Strengthening interdisciplinary cooperation ENGEL Deutschland and TechnologyMountains

The ENGEL Deutschland Technologieforum Stuttgart is the 333rd member joining the TechnologyMountains cluster initiative. This further strengthens ENGEL's position as an information and communication hub for the

injection moulding industry in the southwest of Germany. The final decision to become a member was based on the fact that the network is "so big and strong", said Claus Wilde, Managing Director of ENGEL Deutschland at the Stuttgart location, replying to Cluster Managing Director Yvonne Glienke at a press conference. TechnologyMountains works in the three fields of plastics processing, microtechnology and medical technology and reaches thousands of industrial decision-makers every year with over 100 trainings and just as many information events, consultation days and innovation forums. About 150 project partners – including ENGEL – contribute to the network's more than 20 on-going projects. Interdisciplinary cooperation along entire value chains is increasingly becoming a success factor, said Wilde.



ENGEL is the 333rd member of TechnologyMountains. From left to right: Chamber of Commerce & Industry Managing Director Thomas Albiez, Cluster CEO Yvonne Glienke, Chair of Cluster Board Dr. Harald Stallforth, Claus Wilde from ENGEL Deutschland and Marius Fedler, CEO Kunststoff-Institut Südwest.

## Excellent production supplier Continental Automotive honours ENGEL

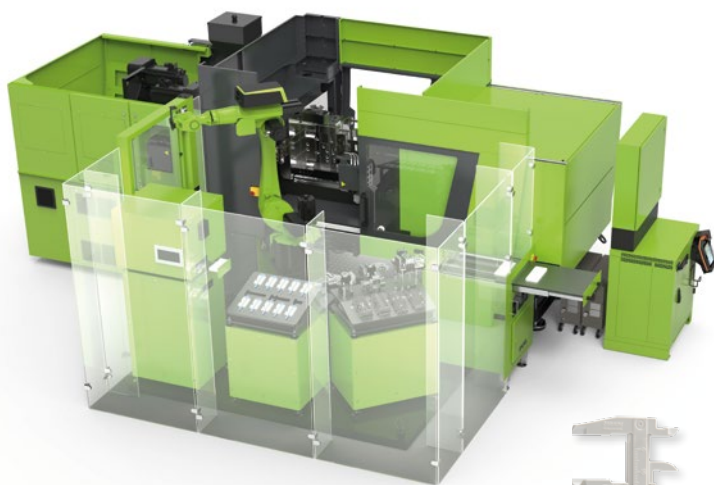


Dr. Stefan Engleder, CEO of the ENGEL Group, (centre) and Thomas Auböck, Sales Manager ENGEL automotive, (3rd from left) accepted the award.

Picture: Continental

Continental Automotive presented ENGEL the Supplier of the Year Award for ENGEL's outstanding performances. Continental Automotive uses injection moulding machines, robots and integrated system solutions from ENGEL in all business units worldwide. ENGEL technologies make an important contribution to the satisfaction of Continental customers, the panel stated. The award was preceded by a comprehensive evaluation process. Among others, the criteria quality, technology, commitment, costs, and purchasing conditions were evaluated. "As a technology company, we highly appreciate the contribution our suppliers make to the industrialisation of new functions and products," said Nikolai Setzer, member of the Executive Board of Continental AG and spokesperson for the Automotive Board, at the award ceremony in Regensburg. ENGEL received the award in the injection moulding machines category. ENGEL supplies 14 Continental locations worldwide with a wide range of injection moulding machines, automation and integrated systems solutions.

### **Efficient and cost-effective for small batch numbers** Interplastica in Moscow



With its focus on small batch sizes, ENGEL is following the trend towards product individualisation and more variant diversity at Interplastica 2020 in Moscow at the end of January. Moulds with changeable inserts are often used in injection moulding in order to be able to cover high variant diversity in a cost-effective way. With this trade show exhibit, ENGEL took this principle one step further in collaboration with Braunform and other system partners. The presented systems solution supports a fully automated exchange of mould inserts in just one minute. The mould of the



all-electric e-motion 170/120 TL injection moulding machine is equipped with the fast-switch mechanism patented by Braunform. During the show, the machine produced the two geometrically different components of a calliper with a quick change. From good part to good part, the set-up process takes only one minute, although the two components have different shot weights.

### **Well positioned New representatives in Chile**

NOBLECORP (Servicios Tecnicos Industriales SPA) is the new ENGEL representative in Chile. The two business partners thereby are expanding their cooperation. NOBLECORP is already successfully working for ENGEL in Peru. "We are delighted to have NOBLECORP for the important Chilean market on board", says Christian Reisinger, President Latin America of ENGEL. "NOBLECORP already has an established sales and service team in Santiago de Chile and is very familiar with the market. We can ensure a high level of continuity in customer service. Together with NOBLECORP, we will also further expand our customer base in Chile. Like ENGEL, NOBLECORP is a family business that can look back on over 70 years of company history. The location in Chile is managed by Jean Paul Cohn. Sara Barbón is responsible for ENGEL customers. For many years, Euromaq represented ENGEL products and technologies in Chile. After the company withdrew from the injection moulding market, ENGEL is now repositioning its activities in Chile. "Euromaq established ENGEL very well in Chile's plastics industry. We would like to thank the entire team for their great commitment," Reisinger emphasises.



NOBLECORP Team Chile, from left to right: Osvaldo Caro (Technician), Jean Paul Cohn (Managing Director), Carlos Díaz (Sales).

Picture: NOBLECORP



## Thermoplastic composites – a significant trend CU conference in Schwertberg

In February, more than 100 international participants surrounding the network of Composites United e.V. (CU) met at ENGEL's headquarters in Schwertberg for a conference titled "Thermoplastic composites – a

significant trend?" Invitations to the event were sent out by the regional Carbon Composites (CC) divisions CC East and CC Austria, as well as the CU teams Multiple-Material Design, Thermoplastic Composites, Manufacturing Processes & Automation, Additive Manufacturing and Tool & Mould Making. The event was hosted by ENGEL AUSTRIA, the latest member in the Composites United network. The top-level keynote speeches ensured the strong interest of the attendees from industry and science. For example, Michael Krah from the start-up ROBIN introduced a new, mobile injection moulding technology in his keynote presentation. The production unit is flexible and automated by robots and enables the cost-effective functionalisation of flat metal or fibre composite prepregs. Besides the keynote speeches there was plenty of time for networking. In addition, ENGEL invited the conference attendees to take part in plant tours. "I am delighted that this inaugural visit to ENGEL was such a remarkable success. The event in Schwertberg with guests from the entire DACH region on the one hand confirms that thermoplastic composites is a hot topic, while on the other hand it also proves that the host was very interesting for the attendees", summarised Dr. Thomas Heber from the CU network.



More than 100 attendees followed the invitation to the CU conference.

## New Head of Sales ENGEL Deutschland in Nuremberg

Sebastian Dombos assumed his position as the new Head of Sales at ENGEL Deutschland in Nuremberg on 1 February. Over the next few months he will be joining the team before succeeding Ralf Christofori as Managing Director of ENGEL Deutschland GmbH at the Nuremberg location in April 2021. Ralf Christofori will be retiring at this time. "We are pleased to have Sebastian Dombos, a proven industry expert, for this important position", says Dr. Christoph Steger, CSO of the ENGEL Group. "We can prepare for the change in generation and ensure a high degree of continuity for both our customers and our employees. Until then Mr. Dombos and Mr. Christofori will collaborate closely to further strengthen and expand the strong market position in the region." Sebastian Dombos brings a lot of experience to his new area of responsibility. After graduating as mechanical engineer and industrial engineer, he has worked in the plastics machinery industry for 17 years.



The Nuremberg subsidiary is responsible for the federal states of Bavaria and Saxony and part of Thuringia. It has 75 employees.

Sebastian Dombos is the new Head of Sales at ENGEL in Nuremberg.

## New subsidiary founded ENGEL in Japan



Yuji Takeda has taken over the management of the new subsidiary in Japan.

ENGEL has strengthened its market presence in Japan by establishing its own sales and service subsidiary in Tokyo. "The Japanese market is continuing to gain importance for us", says Gero Willmeroth, ENGEL's Regional President East Asia and Oceania. "Innovative processing technologies and the digitalisation of injection moulding processes are the focus for plastics processors. With our own subsidiary, we can support our customers in an even better way in these particularly consulting-intensive topics and respond more quickly to local requirements." The Managing Director of ENGEL Japan KK is Yuji Takeda, who brings experience with ENGEL injection moulding machines and technologies to his new role. He started on 1 October 2019, and has a service engineer and an assistant on board. In the second quarter of this year, a service technician from ENGEL Austria will also move to Japan to support the development of the subsidiary during the first few years. For many years, ENGEL has worked with the Correns Corporation trading company in Japan. The customers in Japan



have been personally informed about the change. "We enjoy a high level of trust from our customers, which we are further strengthening with this step. The investment in Tokyo underlines our commitment to the Japanese market", says Willmeroth.

### **Balancing the use of CO<sub>2</sub>** **Symposium at ENGEL in Stuttgart**

Establishing a circular economy presents the plastics processing industry new challenges. These were the focus of the symposium "Plastics in Transition", hosted by the TechnologyMountains cluster initiative and the Kunststoff-Institut Südwest at the ENGEL Deutschland Technologieforum Stuttgart. Both the Volkswagen customer promise to deliver only CO<sub>2</sub>-neutral vehicles in future and the issue of waste accumulation in the world's oceans, to which the plastics industry must find answers, were discussed. It quickly became apparent during the conference that plastic is too valuable to throw it away and that the advantages of the material must be brought more into focus in public debate. That's for example Stefan Schmidt's, Kunststoff-Institut Lüdenscheid, opinion, who seeks to link politics, processors, raw material manufacturers, OEMs and waste disposal companies in a single project. Sven Weihe of PlasticsEurope Germany explained the actual value of plastic, while Stephan Schunkert of KlimAktiv Consulting showed that not only Volkswagen, also Daimler and Siemens have decided on CO<sub>2</sub>-neutral products and that this will only work if the suppliers also consider their CO<sub>2</sub> footprint. The most important target of the event: moving forward beyond the theory. Claus Wilde, Managing Director of ENGEL Deutschland, presented the technology possibilities that are already being leveraged in plastics processing today to make wider use of recycled materials and further push the development of a circular economy for plastics.



### **The plastics industry has lost one of its great pioneers** **Deeply saddened by the passing of Dr. Alfred Lampl**

ENGEL's former Technical Director, Hon.-Prof. DI Dr. Dr. mont. h.c. Alfred Lampl, passed away in October last year at the age of 89. Dr. Lampl shaped the technical innovations of the injection moulding machine manufacturer for 25 years and, as a member of the founding generation, played a decisive role in ENGEL's development from a small business of ten employees to today's global systems supplier. "ENGEL would not be what it is today without Dr. Lampl," says ENGEL CEO Stefan Engleder in recognition of his loyal service. "We, the owners of the company, our families, the employees of ENGEL and many engineers, are deeply indebted to his contributions." Alfred Lampl first joined the company in 1968 as Head of Engineering, being responsible for machine design, applications technology, R&D and mould making divisions. In early 1986, as the Technical Director, he assumed overall responsibility for engineering and production, which he held until his retirement in 1993. Following, Dr. Lampl remained closely associated with ENGEL as a consultant. From the very beginning, Dr. Lampl pursued the strategy of continually developing new products in response to customer requirements. To this day, strong customer focus is an essential guiding principle of research and development at ENGEL. Tie-bar-less technology is one of his greatest achievements. "Dr. Lampl had the outstanding ability to listen and distinguish what is important from what is unimportant. He managed to find answers to seemingly unsolvable questions," says Engleder. 32 patents and patent applications are proof of Alfred Lampl's innovative genius and visionary thinking.



75 years of ENGEL

# Time travel back to the future of injection moulding

75 years of experience. Absolute passion. Customer-focused innovation. – This is the motto under which ENGEL is celebrating its 75th company anniversary this year. From a small repair workshop to one of the world's leading plastics machinery manufacturers, ENGEL's development is a story of strong vision and courageous decisions, of foresight and seized opportunities.

The company exhibit in Schwertberg is opening its doors just in time for the anniversary. ENGEL AUSTRIA has created a new port of call for the roughly 100 visitors who visit the main plant every day. Above all, it offers a visionary outlook and at the same time highlights the milestones in the company's history. "We invite our customers, partners and guests to immerse themselves in the history of ENGEL through our company exhibit. If you understand where you come

from, it is easier to agree on where you want to go together in the future", says ENGEL CEO Stefan Engleder.

## New company exhibit at headquarters

The exhibit takes visitors from the beginning of the company in 1945 through to the present and further into the future, and provides a platform for new, shared ideas. Be the first – this has always been ENGEL's guiding principle.





- From the start, ENGEL focused on series production with the delivery of the first injection moulding machines in 1952, making it a pioneer and a model in its own industry and beyond.
- ENGEL introduced microprocessor technology in 1979. Injection moulding machines became intelligent production systems.
- As early as 1980, ENGEL's in-house robot development and production paved the way for ENGEL to become a system solution provider for highly efficient, reliably controllable integrated processes.
- In 1989 ENGEL revolutionised the injection moulding world with the world's first tie-bar-less machine. Setting standards for maximum flexibility and efficiency to this day.
- In 2015, ENGEL's inject 4.0 integrated the framework for the systematic use of process and production data, the networking of machines and ancillary equipment and the use of adaptive production systems in the injection moulding industry.
- In 2019, ENGEL was one of the first companies in the plastics machinery industry to sign the global commitment to the New Plastics Economy launched by the Ellen MacArthur Foundation, whose goal it is to help plastics transition to a closed material cycle.

## Customer proximity ensures a competitive advantage

ENGEL focused on globalisation at an early stage. The first foreign subsidiary was founded in 1972, the first production plant outside Austria in 1977. Asia plays a key role in the global production network. ENGEL is the only western injection moulding machine manufacturer producing injection moulding machines and systems solutions on site at three plants in Asia for the local markets.

Customer proximity is not only evident in ENGEL's local presence. For ENGEL, customer proximity also means responding to individual customer requirements and anticipating future needs and trends at an early stage. Always with the aim of turning them into products and services that generate long-term competitive advantages for ENGEL customers. As a family business, ENGEL always focuses on people. ENGEL continuously invests in the training and further education of its employees and has greatly expanded and globalised apprentice training. In 2014, ENGEL exported the principle of dual vocational training to China, once again taking a pioneering role in China.



ENGEL now welcomes its guests to the new company exhibit at its headquarters in Schwertberg.





Markus Koppe, Schöfer

Michael Fischer, ENGEL

## "Scouting for new possibilities and new technologies."

Functional, protective, communicative and always attractive – most industrial products have sophisticated surfaces. Whether in automobiles, household appliances or consumer electronics, foil solutions are more often the answer to meet growing industry requirements. The companies ENGEL, Leonhard Kurz and Schöfer have been pooling their expertise and experience in this field for more than 15 years and are international technology leaders. In this Techtalk, Martin Hahn, Head of Application, Technology & Innovation at Leonhard Kurz, Dr. Markus Koppe, Head of Advanced Technologies at Schöfer, and Michael Fischer, Head of Business Development Technologies at ENGEL, discuss new challenges and the latest milestones in the joint development.

**How big is the share of IMD processes already today in the production of industrial products with demanding surfaces?**

**MARTIN HAHN:** According to our estimates, around 40 percent of all design and functional plastic surfaces today are produced using IMD or IML. Especially when it comes to foil technologies, this share will continue to rise.

**What is driving this trend?**

**MARTIN HAHN:** In terms of industries, automotive and consumer products are certainly the biggest drivers. Really exciting are the new requirements in the automotive industry. We are living in an age in which the entire vehicle is changing. This starts with drive technology, continues with autonomous driving and extends to new usage models such as car sharing.



*Martin Hahn, Leonhard Kurz*

» **What the customer gets from us is a process tailored to their requirements. This means we eliminate some of the process risk for the customer."**

*Martin Hahn, Leonhard Kurz*

**MARKUS KOPPE:** At the same time, a completely new world is opening up in communication between the driver and the vehicle, and the whole thing is accompanied by an unprecedented variety of design. Now the design is the decisive factor in a purchase and this includes many digital elements. For example, ambient lighting for targeted accentuation of the design.

**What opportunities arise from this development?**

**MARTIN HAHN:** Never before in automotive history have so many questions remained unanswered at the same time. The entire industry is searching for new possibilities, new technologies.

**MICHAEL FISCHER:** The transformation of the automobile is a powerful innovation driver. The need for new technologies is huge, and the plastics industry in particular is benefiting from this. For these completely different, but almost always complex requirements, foil solutions in combination with injection moulding enable the balancing act between quality and cost efficiency.

**And they are not reserved for the premium segment.**

**MICHAEL FISCHER:** That's precisely the point. Process integration sometimes eliminates entire work and logistics steps. That saves time, energy and raw materials. Through the intelligent combination of materials, technology and the manufacturing process we achieve

economies of scale and massive cost advantages.

**MARTIN HAHN:** For example, polyurethane technology totally removes the need for painting. Polyurethane ensures a 3-D effect and makes it easier to vary wall thickness because it offers more freedom than thermoplastics.

**MARKUS KOPPE:** On top of this, we can join various material worlds in an efficient way. For example textiles and plastics, including reel-to-reel. This way we can offer plastics technology solutions for part production that follow the trend towards natural materials as well.

**How far have your joint venture developments come concerning serial production readiness?**

**MARTIN HAHN:** Foil applications have long been established in series production for design elements such as decorative trims or control panels that shape the appearance of the interior. Here it is usually a matter of value perception thanks to, say, the reproduction of real wood or metallisation. In the field of functional surfaces, the integration of optical fibres for ambient lighting is a starting point. Current projects are addressing capacitive sensor technology for control elements. From consumer electronics through domestic appliances to the automotive industry, the trend towards the seamless integration of capacitive touch controls in the decorated surface can now also be seen in three-dimensional applications.

**MICHAEL FISCHER:** Current developments are for

example intelligent foil systems that are located in the vehicle's A- or B-pillar to give the car sharing user access to the vehicle. There are already existing solutions for this application.

**MARKUS KOPPE:** In the near future, sensors on vehicle exteriors will increasingly be integrated directly into the plastic surfaces. This is more efficient in production and also the sensors are better protected against dirt and damage, which makes them more durable.

**MICHAEL FISCHER:** It is interesting to note that the invisible integration also increases consumer acceptance. It is not only a question of the trust that the industry places in us as suppliers, but also a matter of the trust that consumers place in modern vehicles, to which they entrust their lives.

**Two innovative applications were on show at K 2019. One of them, the production of sample parts with different decorations in the reel-to-reel IMD process, will be presented in China next. What new development steps does the exhibit illustrate?**

**MICHAEL FISCHER:** In addition to process integration, the production cell leverages a broad efficiency spectrum. We are processing polypropylene, which was previously not possible in this area, but which is becoming increasingly important for automotive interiors, and we are also adding recycled material from production waste. Scrap parts can be shredded together with the IMD foil and be fed back into the process. Both the possibility to process PP and the recycling aspect are major steps towards even lower unit costs and increased sustainability. In addition, we are using structural foaming technology when processing the PP, which saves raw material and reduces the part weight.

**What was the response like at the K show?**

**MICHAEL FISCHER:**

The topic PP was very well received, as was the fact that we already have experience with recycled PP. Visitors at the show had very detailed questions, some of them already had concrete components in mind, both from the interior and exterior of the car and from the household appliance sector. This shows that our joint developments are well known and that the industry has recognised the great potential and range of applications.

**MARTIN HAHN:** And internationally. The enquiries came from Europe, the USA and above all also from China. For some visitors to the K show stand, things are already moving in a very concrete direction. We are currently evaluating the parts.

**What is the general situation regarding the sustainability of foil technologies?**

**MARTIN HAHN:** Sustainability has always been an essential aspect of our collaboration. Nevertheless, for a long time it was true that foil-based composite parts could only be thermally recycled. We achieved a breakthrough at the K show. IMD parts can be recycled.

**MICHAEL FISCHER:** Huge benefits can be realised in terms of the manufacturing process' energy consumption. Due to the high degree of process integration, the CO<sub>2</sub> footprint is significantly smaller than that of conventional multi-stage processes for manufacturers of sophisticated visible components. It is noticeable here that complete process and logistics steps and "parts tourism" are no longer necessary. For intermediate

More info:

[www.visionary.design](http://www.visionary.design)

[www.plastic-decoration.com](http://www.plastic-decoration.com)

[www.engelglobal.com/en/clearmelt](http://www.engelglobal.com/en/clearmelt)

[www.engelglobal.com/en/foilmelt](http://www.engelglobal.com/en/foilmelt)





finishing, parts are often transported by truck from Germany to Eastern Europe and back again.

**MARKUS KOPPE:** I see another aspect: we are protecting sensitive electronics underneath sealed, robust surfaces. As a result, this lengthens the service life of the components. We have received reports on this from the USA. The aim is to adapt the trim service life to take it closer to that of the sensors. So far, the parts have had to be replaced every two years because they quickly suffered from scratching. We can prevent this by flow-coating with polyurethane.

#### **What are the next development objectives?**

**MICHAEL FISCHER:** We have reached series production readiness on the fundamental levels – with highly integrated, very efficient processes for lowest unit costs. The focus is now on introducing the technologies to even more applications. The further development will be primarily driven by applications.

#### **But are we thinking beyond this? Are the individual user industries learning from one another?**

**MARTIN HAHN:** Definitely, yes. The surface technologies that we offer today do not focus on specific industries. Instead, the common denominator is the perceived value of the surfaces to be created, and reducing unit costs. Sometimes applications come up that we had never even thought about. Light switches, for example. There are always some lessons to learn. Some concept elements and learnings can be transferred, even if each industry has its own specific requirements.

#### **How important is interdisciplinary cooperation in this area?**

**MARKUS KOPPE:** Interaction with our partners is essential for the success of the project. We offer moulders a process that is perfectly integrated in all

phases and ready for series production. We customise the concept to meet the customer's individual requirements. Together we have developed this technology step-by-step over the last 15 years.

**MICHAEL FISCHER:** From the materials to the mould and automation, through to the processing technology and injection moulding machines, development is closely interlinked. Each development step presupposes other steps. This is the exciting thing about it, for me. Although different companies and locations are involved we are a team with a common goal. One company alone could not solve this problem, because so many different areas of expertise have to work together.

**MARTIN HAHN:** What the customer gets from us is a process tailored to their requirements and as a technology partner, we eliminate some of the process risk for the customer. We ensure that operations can start quickly and that the production unit works. This is precisely why we need this collaboration with our partners.

#### **Technologies for smart surfaces**

Foilmelt and clearmelt are two series production ready technologies, jointly developed by ENGEL, for processing of design and functional foils in a highly integrated and automated process. foilmelt enables an individual surface design and functional integration with capacitive and wired foils through back-injection. In the IMD or IML process, multi-layer composite foils are processed with effects such as metallic lacquer, aluminium design, chameleon look or holograms. The clearmelt process uses multi-component technology in combination with IMD or IML to flood-coat a thermoplastic carrier with transparent polyurethane. The results are scratch-resistant, high-quality surfaces with a visually impressive 3D effect.





*Lightweight caps pose challenging requirements for the machine.*

## ENGEL presents **the next generation e-cap**

Even faster, even more stable, even more efficient ENGEL presents the next generation of its all-electric e-cap injection moulding machine series for caps. The production of 29/25 lightweight caps with cycle times of less than 2 seconds clearly demonstrates how the shortest cycle times can be combined with the highest precision and lowest energy consumption for continuously increasing requirements. The e-cap is available in four sizes with clamping forces from 2,200 to 4,200 kN.

ENGEL already sets new standards with the presentation of the first e-cap at K 2010. Until then, hydraulic machines using accumulators for the injection movement were the standard for the production of caps. Using the all-electric drive technology in this field of application was a revolution. To date, the e-cap is the most energy-efficient cap machine on the market. At the same time it is the only high-performance machine tailored to the requirements of the caps and closures industry that is all-electric even with a clamping force as high as 4,200 kN. With an ROI of less than two years, the e-cap has quickly established itself globally.

"Since 2010, the requirements for caps have changed substantially", says Friedrich Mairhofer, Product Manager for all-electric injection moulding machines at ENGEL, explaining why the continuous further development is being integrated into a next generation machine. Part weight reductions play a central role. "Today, caps for still water are produced with a weight significantly below one gram," says Mairhofer. "As a result, the cooling and cycle times have dropped. Ten years ago the cycle

times were 2.5 seconds. Today's cap machines need to be capable to produce at cycle times of 2-seconds and faster." When developing the new e-cap, the main focus was therefore on both performance and stability. The new e-cap achieves even faster mould movements and is designed with an even more stable machine bed for more frequent load cycles.

### **Highest dynamic performance with frequent load changes**

An e-cap 2440/380 demonstrates the series' new performance achievements by producing 29/25 caps in a 96-cavity mould by Plasticsud. The shot weight is 1.3 grams per cavity with a cycle time of less than 2 seconds. An HDPE from Borealis/Borouge is being processed under realistic production conditions. The system is equipped with camera-supported 100 percent quality inspection by IMDvista and a dry air system by Eisbär. Further system partners are Piovan, PackSys Global and PSG. The application illustrates how stable operations with the new e-cap are, even with extremely short cycles





“

**Caps are becoming increasingly lighter, and the cycle times increasingly shorter. And that is precisely what the new e-cap is designed for.”**

*Friedrich Mairhofer,  
Product Manager All-Electric Injection Moulding Machines*

and very small shot volumes. Outstanding reproduction of surface detail and a maximum number of good parts are achieved.

"Very fast dry cycle times and the parallel movements included in the standard right from the outset make an important contribution to achieving cycle times of less than 2 seconds", as Mairhofer explains. Ejection occurs parallel to the mould opening. What is new is that the directly driven servo-electric ejectors can be reinforced by a switchable hydraulic booster on demand. With the two ejector drive types, ENGEL ensures that the machine operates with the best possible efficiency both during running production and during start-up after a production interruption. While the caps are very easy to remove during ejection in ongoing production, the ejectors have to apply more force in stop situations to release caps that have already cooled down in the mould. Since production interruptions are rare, it is more efficient to hydraulically reinforce the drives than to generally equip the machine with more powerful ejector drives. High forces only when they are needed – that is ENGEL's motto.

The plasticising unit was completely redesigned, as the properties of the materials to be processed have also changed. For CSD caps, the mould flow index (MFI) of today's HDPE grades is between 0.8 and 1.4 g/10 min, which requires particularly high plasticising rates where the cycle times are very short. ENGEL has increased the

torque of the plasticising drive accordingly and developed both a new plasticising screw and a new highly wear-resistant sliding ring non-return valve specifically for cap manufacture. With its new design, the barrier screw processes high viscosity HDPE in a particularly gentle way, even for high throughput levels, while ensuring a very good melting rate and homogeneity of the melt.

### **Optimising energy consumption across the entire system**

Cleanliness and energy efficiency have been essential characteristics of the series right from the outset. With an encapsulated toggle lever and very clean linear guides for the moving platen, the machines reliably meet the requirements of the food industry. All-electric drive technology makes a major contribution to the outstanding energy efficiency. In addition, braking energy is recuperated, preventing the occurrence of power peaks. Thanks to the very high efficiency of the drives, the e-cap machines also require a minimum of coolant. To produce the 29/25 caps, the e-cap 2440/380 operating at high speed requires only 0.37 kWh per kilogram of pellets, and the production cell also has very low energy consumption. "As the system supplier, we precisely match all the components right from the start of the project. This allows us to leverage the full efficiency potential throughout the entire production cell," says Mairhofer.



*The new e-cap with clamping forces from 2,200 to 4,200 kN.*



*Thanks to the new development, the component weight can be recorded inline.*

## **Weighing** parts without losing time

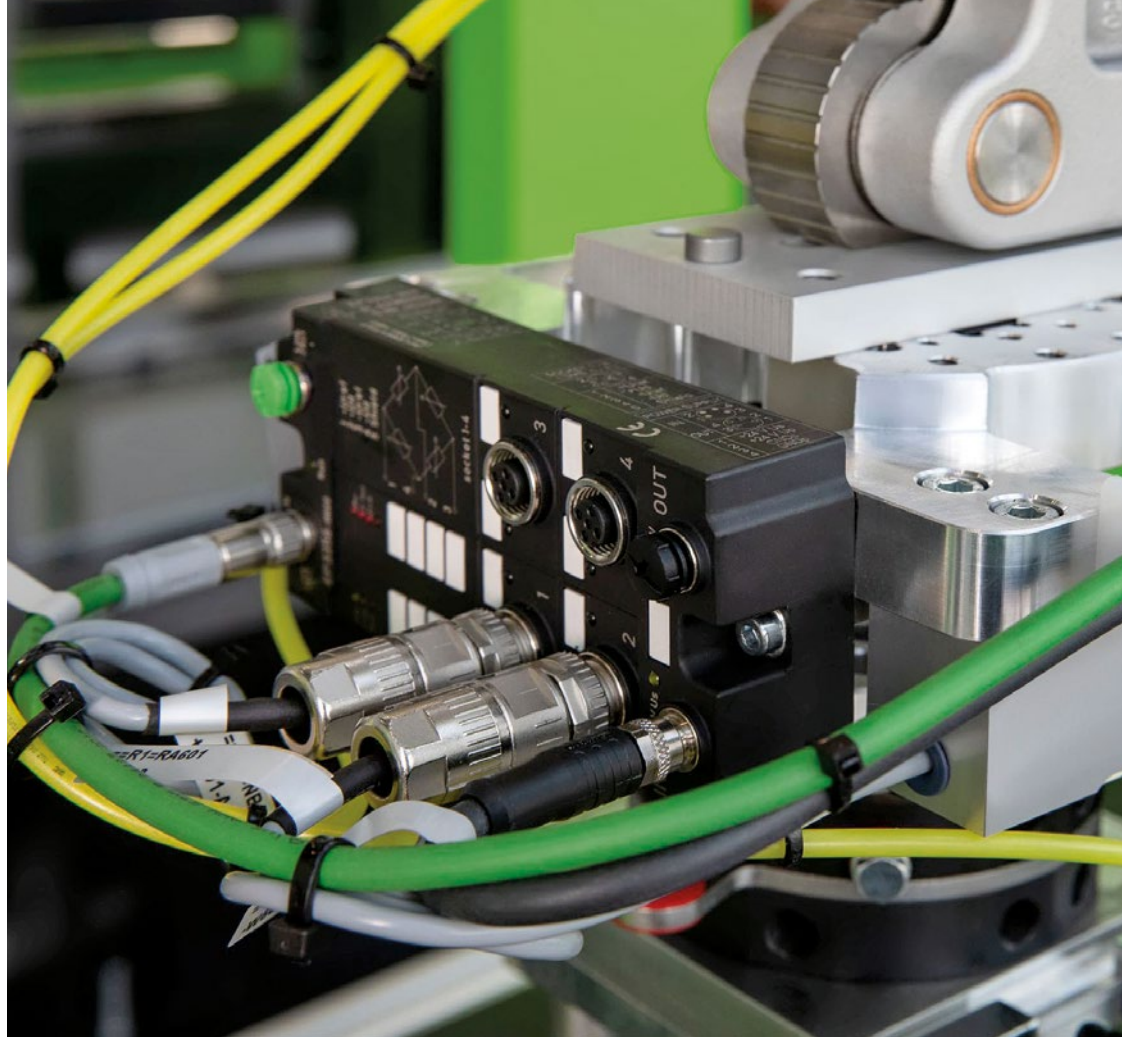
In injection moulding, the component weight reflects the process consistency and as a result the component quality. Components are therefore often weighed manually after production or automatically placed on a scale by a robot and then picked up again. ENGEL has now developed a high-precision load cell for inline weight measurement that can be integrated directly between the rotary axes and the end-of-arm tool of the linear robots from the ENGEL viper series. Because the parts do not have to be deposited for weighing, this allows the part weight to be recorded during on-going production without wasting time.

Based on the part weight, the plastics processor can quickly determine whether, for example, sprues have been cut cleanly or whether there are short shots or flashes. Also sink marks due to missing holding pressure lead to a lower part weight and can be quickly detected. Insert applications are another use case. Missing inserts are detected by checking the weight immediately after the injection moulding process. By weighing, NOK parts can be automatically separated from good parts. Inline weighing is therefore a 100% parts check.

### **Highest measuring precision**

The challenge of performing precise measuring on the robot arm results from the many external influencing factors that can impact on the measurement accuracy. They include, for example, vibrations caused by machine movements or media routing. As a general rule, the less the robot or end-of-arm tool moves and the narrower the media guide is, the more accurate the measurement will be. Taking these aspects into account, ENGEL has succeeded in developing a weighing system for the viper





*The load cell is installed between the rotary axes and end-of-arm tool of the linear robot.*

series linear robots in the 12 to 120 size range that achieves the highest measuring accuracy of comparable systems on the market.

The weighing system is equipped with overload protection (pin and stop edge). This protects the sensors even in the event of a significant overload. Too high a payload only reduces the measuring accuracy.

### **Industry 4.0 as a driver**

The increasing demand for smarter systems is a logical consequence of the use of intelligent assistance systems in Industry 4.0 strategies. To ensure quality and further process optimisation, selected data is recorded, including the part weight. In many applications, weighing the components offers an additional quality inspection option on top of the monitoring and assistance systems already integrated in the injection moulding machine, such as iQ weight monitor and iQ weight control.

For integrated robots, the user interface of the weighing system can be found in the injection moulding machine's CC300 control unit, which makes weight monitoring particularly easy. In the sequence editor, there is a standard sequence for the weighing process; in addition, all

recorded measured values are stored in the machine history. To be able to offer the measuring system for "stand-alone" robots, too, ENGEL has programmed a separate screen for the hand-held unit.

### **Use cases in the automotive industry**

The main drivers of development are the automotive and domestic appliance industries. One of the early adopters of the weighing system is automotive supplier ZKW Lichtsysteme GmbH in Wieselburg, Austria. As a first step, the load cell was mounted on a machine that produces parts with a maximum weight of 150 g. "This application works very reliably with a constant weight; this is precisely why it gives us the opportunity to determine the potential of the new weighing system," explains Markus Benedikt, Process Engineering Injection Moulding at ZKW. "The first test measurements already confirmed the very high measuring accuracy." After these positive results, the system will now be used for the more critical production of larger parts with a shot weight of 750 g. "We expect a significant increase in productivity as the inspection of the parts is done during the production process," says Benedikt.



*ENGEL's solution for in-situ polymerisation for the production of fibre-reinforced thermoplastic components is characterised by particularly compact system technology.*

## **ENGEL reactive unit now available in two sizes:** For even gentler plasticising

In-situ polymerisation opens up great opportunities in the production of fibre-reinforced plastic components with a thermoplastic polyamide matrix. Based on dry reinforcement textiles, polymerisation and moulding are combined, enabling particularly efficient and automated processes in series production, for example, in the automotive industry. The decisive factor for processing efficiency and product quality is the reaction unit developed by ENGEL specifically for the preparation and injection of  $\epsilon$ -Caprolactam. ENGEL has systematically further optimised its solution with a new, smaller size.

Now offering two sizes, ENGEL covers an even wider range of applications and supports its customers from product and process development, through scale-up to series production. The new smaller reactive unit can handle matrix volumes between 10 and 600 cm<sup>3</sup>, offering

great flexibility, especially for technology centres, in the production of test parts, specimens and parts up to a weight of 1.5 kilograms. The second, larger unit can process matrix volumes of up to 1500 cm<sup>3</sup>. Both units are very compact. They integrate the complete media



supply and reduce the footprint required for the entire system. In in-situ polymerisation, the thermoplastic RTM process, pre-shaped dry fibre preforms are infiltrated directly in the mould cavity with the reactive matrix. Thanks to  $\epsilon$ -Caprolactam's low viscosity in molten state, the dry fibres can be impregnated particularly well. Compared to duroplastic RTM, longer flow paths and a higher fibre content are possible. When the  $\epsilon$ -Caprolactam is polymerised to create polyamide 6, a composite with particularly high load-bearing capacity is formed that can be functionalised by injection moulding immediately after manufacture in the same process.

### Risk of wear significantly reduced

Servo-electric injection pistons are a proven solution for injecting the reactive components. They support particularly precise adjustment of the injection volume and absolutely synchronous injection of the two components. The recirculation common in reactive systems is deliberately avoided. The volume of monomer melted is limited to what can be processed directly. The reactive components have a particularly short residence time in the system and are not prone to residence time scatter. This in turn prevents thermal damage to the material. A further benefit of ENGEL's system comes into play in testing and technology centre operations with frequent recipe and batch changes: the residual material can be quickly removed from the system without the system needing to be flushed.

The magnetically coupled screw conveyors for feeding the solid reactive components are a new feature. They ensure reliable feeding of the solids and therefore a stable process. The magnetic couplings are contact-free and provide a wear-free seal to ensure that the entire

material feed is evacuated. Within the user-defined limits, the solids are continuously dosed and plasticised using an approach that is largely independent of the injection process. Up to the moment when the material is fed in, storage and conveying of the solids remain strictly separated thermally and spatially from the melting zone underneath. The vacuum above the melt is maintained even when topping up the storage hoppers material, and this further boosts both process stability and the product quality.

### Compatible with all ENGEL injection moulding machines

Both sizes of the ENGEL reaction unit can be combined with ENGEL injection moulding machines from all series. A retrofitting option is available for injection moulding machines with the CC300 control unit. Complete control integration ensures that the entire process can be managed centrally on the machine display. Optionally, the reaction unit can be operated as a stand-alone system with its own CC300 control unit. The range of applications for in-situ polymerisation extends from small parts with thin wall thicknesses through to large, highly stressed structural elements in lightweight automotive engineering, automotive electronics, technical moulding and sports equipment manufacturing. When overmoulding metal inserts or cables in very small structures, in-situ polymerisation can offer advantages over other processes – even without fibre reinforcement. At its Center for Lightweight Composite Technologies in Austria, ENGEL is collaborating with the Johannes Kepler University Linz, and mould makers Schöfer, on the further development of the in-situ polymerisation process.

### Thermoplastic composites

Thermoplastic composites are becoming increasingly important in lightweight engineering. There are two main reasons for this: On the one hand, the end-to-end thermoplastic approach makes it possible to efficiently integrate the forming and functionalisation of fibre composite semi-finished products, which reduces unit costs. Secondly, the use of exclusively thermoplastic polymers makes it easier to develop recycling strategies. With in-situ polymerisation and the ENGEL organomelt technology, system solution provider ENGEL already has two production-ready processes for the manufacture of thermoplastic composite parts in its product range. Test capacities for both are available at the ENGEL Center for Lightweight Composite Technologies in Austria.



*smart machine: Smart assistance systems such as iQ weight control balance out process fluctuations before rejects are produced.*

# Successful digitalisation:

## Success is driven by people

The global player Utz Group has developed its own solution for temperature control of injection moulds using ENGEL modules e-flomo and iQ flow control digital temperature control. Following this, ENGEL and Utz jointly developed a practical implementation of this solution in several new production cells. In digitalising temperature control, Utz is taking a further step towards Industry 4.0. The solution is so successful that it is to become the group standard at all production locations.

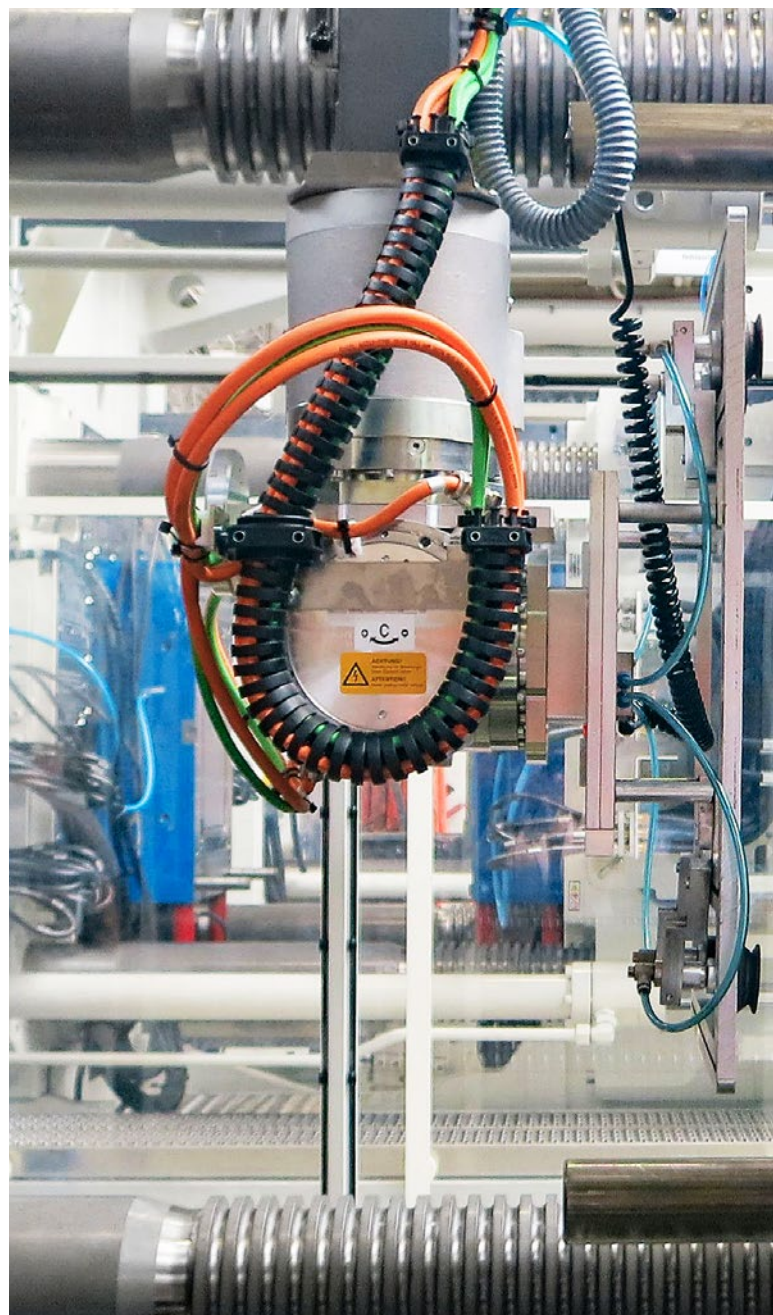
Even in an age of digitalisation, "our success is driven by people, as this project has once again demonstrated," as Frank-Olaf Schütte, Technical Manager at Georg Utz in Schüttorf, makes clear right at the start of our visit. "If I can motivate the whole team to participate, then everybody will be excited about the digitalisation project regardless of their age. The older ones are happy that they are finally getting what they have been dreaming about for 20 years, and the younger employees are excited about the modern control unit."

"Utz is a classic family business with its heart in the right place," says Dr. Jan Giesbrecht, CTO of Georg Utz Holding in Bremgarten/Switzerland, explaining the company's philosophy. "We attach great importance to people and employees here. This is not just a mission statement; we are really engaged. For example, we have over 40 trainees who we continuously support. They can complete a dual course of study with us after completing their training. Particularly in the current discussion about plastics – although we are only producing reusable products – our focus is on sustainable and energy-efficient production."

The Utz Group, headquartered in Bremgarten, Aargau, operates internationally with eight locations worldwide. The group specialises in the manufacture of containers for warehousing and transporting goods as well as load carriers and pallets made of recyclable plastics. With 500 employees, the Schüttorf location in northern Germany is the largest in the group. This location has three production areas, the injection moulding area being the largest.

### Significant reductions in energy consumption

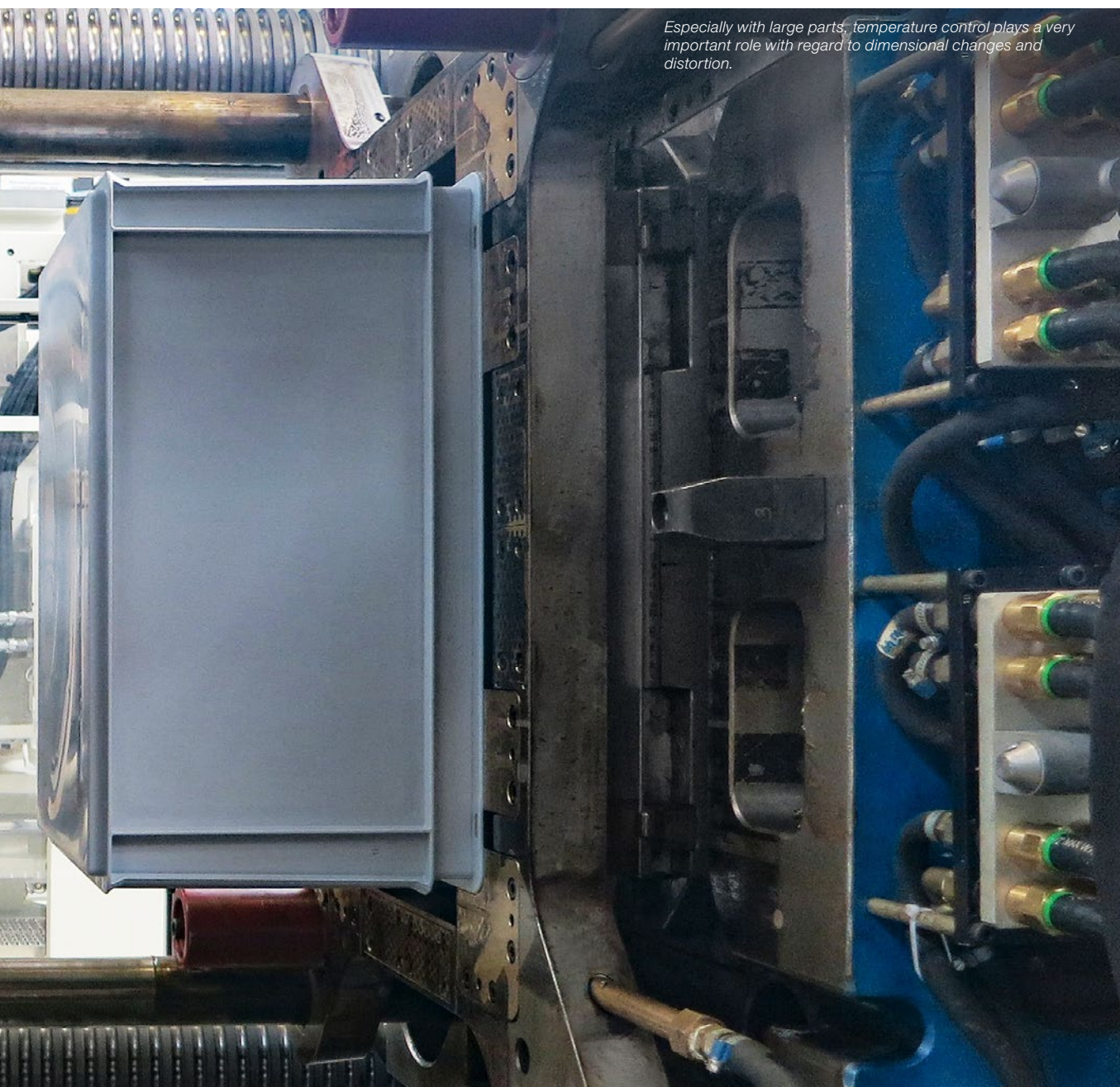
The idea behind the new production line was examined in detail in a bachelor thesis by Jannik Vrielink, a former trainee and now process engineer at Utz. The topic was "Modern cooling systems". "In recent years, we have been challenged to optimise our processes in different aspects of this topic," says Schütte. The focuses are



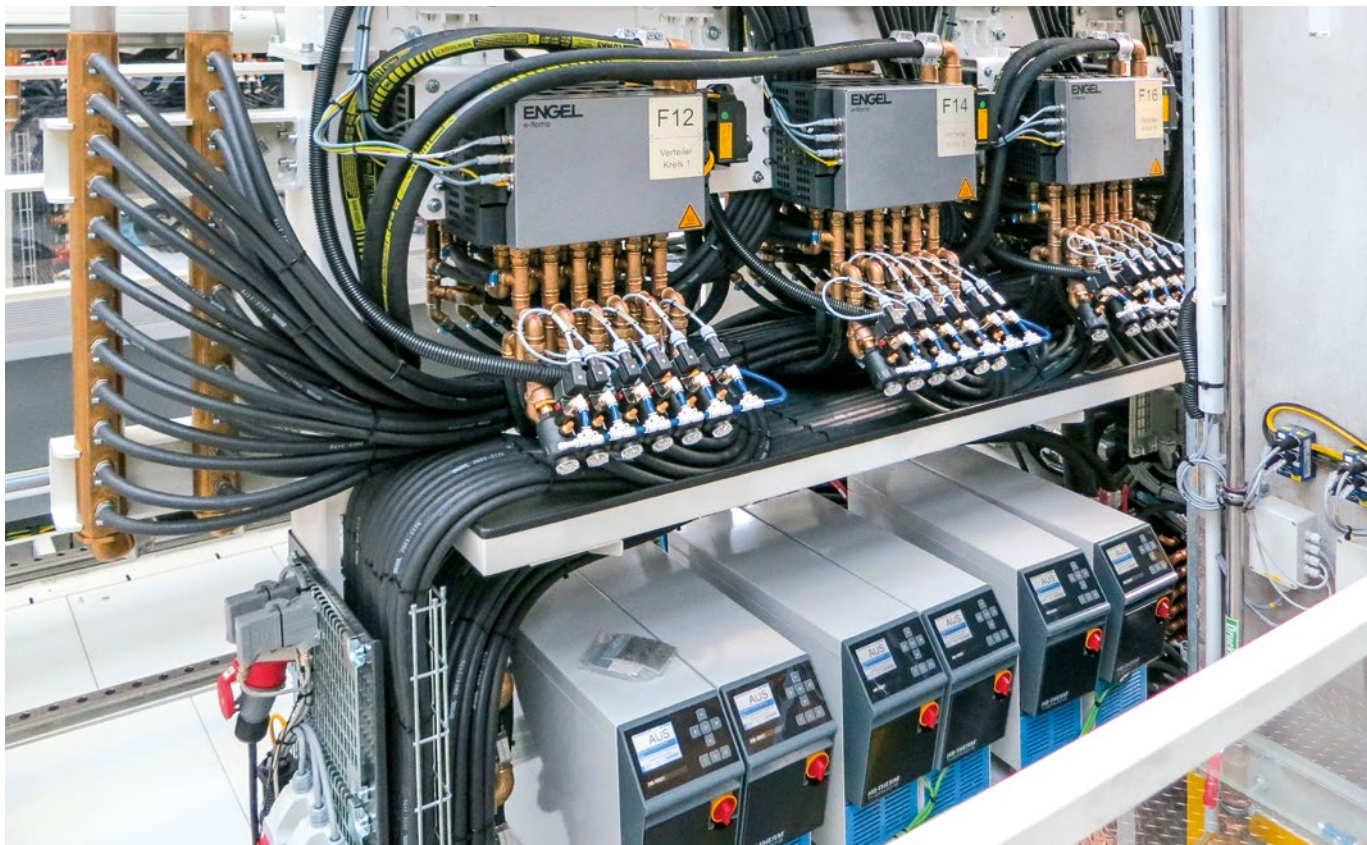


mould set-up, energy efficiency, process stability and sustainability. "We have broken this down into different projects, one of them being state-of-the-art cooling," Schütte continues. "We equipped a prototype injection moulding machine with a cooling system up front and gained experience. This meant that we were able to implement a complete package for the new machines – together with the findings from the bachelor thesis."

One result of the bachelor thesis was that often less temperature control is required than set in analogue controls. In tests, Vrielink determined the extent to which the flow can be reduced without impairing the quality of a part. This made double-digit percentage energy consumption savings possible. Cooling has relied on analogue controls up to now at Utz. "The flow volumes were adjusted manually on the machine







*Compact integration: the production cells are equipped with e-flo mos and temperature control units located on the sides and to the rear of the machine.*

with a classic controller with a sight glass", as Schütte reports: "Until now we have not had any way to validate these processes. We see great potential for the future in this approach to digitalising cooling and temperature control. For the future, however, we are looking to make cooling more transparent, not only here at this location, but throughout the entire Group, and to push forward with digitalisation as a result." It was in this context that the use of ENGEL e-flomo was discussed and implemented at Utz.

### **Dynamically controlled multiple-circuit temperature control**

e-flomo is the electronic temperature control water manifold which plays a central role in the digitalisation and networking of mould temperature control in ENGEL production units. The iQ flow control software developed by ENGEL controls the flow rates on the basis of the measured values determined by e-flomo and adapts the temperature control process dynamically and independently to the respective process conditions. Where ENGEL e-temp temperature control units are used, this can also include demand-dependent control of the pump speed in the temperature control units. Through this interaction, iQ flow control makes it possible to combine maximum temperature stability with maximum productivity and energy efficiency. The reason why ENGEL is focusing so intensively on temperature control is that mould temperature control has a very significant influence on the efficiency and quality of the injection moulding process. In many

cases, too little attention is paid to this aspect in practical applications. "We have succeeded in initiating a rethinking process with many of our customers," says Klaus Tänzler, Product Manager Temperature Control at ENGEL. "In 2010, we entered the world of temperature control with flomo. Classic temperature control uses a static flow. If you have six temperature control channels on the mould and something changes in one of them, the flow rate changes in all of them. Thanks to our dynamic system, we can now react to this change and balance all the channels." ENGEL continuously works intensively on this subject, as shown by the further enhancements: e-flomo, e-flomo premium, iQ flow control and e-temp. As a systems expert, ENGEL therefore considers the continuous optimisation of the temperature control process to be one of its core competencies and is actively promoting digitalisation in this area. The solution based on e-flomo and iQ flow control, which Utz and ENGEL have developed over the past one and a half years, has been implemented in a total of four identical production cells. More e-flo mos have been installed on each of the 1000-ton injection moulding machines than in any other ENGEL project to date. The e-flo mos have been arranged in an extremely compact way, both on the sides and at the rear of the machine. Each machine is equipped with several temperature control units, which are also located on the sides and at the rear of the machine. Up to 60 temperature control circuits are supplied on a single mould. ENGEL has configured the system such that





From left to right: Jannik Vrielink, process engineer, Josef Krnak, injection moulding production manager and Ingo Schohaus, plastics process mechanic (all Georg Utz), Klaus Tänzler, product manager temperature control, ENGEL AUSTRIA, Christoph Hölscher, sales engineer, ENGEL Deutschland, Frank-Olaf Schütte, technical manager Georg Utz and Dr. Jan Giesbrecht, CTO Georg Utz Holding.

it is possible for each individual temperature control circuit to switch between cooling, heating, leak-stop and purging operating modes at the machine control panel without having to move a single hose coupling.

### Temperature control integrated in the control unit

The global idea behind Utz's temperature control concept is that the operator no longer adjusts the settings manually. Instead, the settings for cooling and temperature control are integrated into the CC300 control unit on the ENGEL injection moulding machine. The machine operator can check or monitor the parameters during mould change or running production.

"For us, sustainability not only means optimising set-up times and reducing rejects, but also making the mould set-up easier for our employees," says Schütte. "There is always a certain proneness to errors, if you do the mould set-up manually. But if the data is available on the control unit, and is automatically transferred, you can repeat the optimum process without error. Scrap rate during start-up is reduced significantly." And during production, too, Utz's very clear goal is to avoid rejects.

### Empowering maximum flexibility

"The important thing about our machines is that they can be used universally," says Schütte, addressing another key issue. "Different moulds are used on each machine. Flexibility is very important to us. The machines are all identical, we have to be able to run and repeat the exact same process on each machine". The particularly demanding range of products includes large, thin-walled containers made of polyethylene. Maximum stability is crucial here in order to avoid distortion.

Polyethylene and polypropylene make up the lion's share of the raw materials processed in Schüttorf. On top of this, there are electrically-conductive

polymers and a large number of recycled materials. Often, different materials that require different mould temperatures are processed in one and the same mould in rapid change cycles, which, in some cases, only relate to individual temperature control circuits. "Thanks to dynamic single-circuit temperature control, we can change the material within a very short time and immediately run a stable process," says Schütte.

### Automatic manifold blow-out in the mould

A higher level of process stability is another benefit. After all, cooling circuits can become clogged. "With analogue cooling, you wouldn't typically notice a problem in on-going production," says Schütte. "But if you monitor each cycle individually, you detect clogging at an early stage and can take remedial action. In the digital system, you can set intervention limits for alarm signals."

Residual water and dirt in the temperature control channels of injection moulds can lead to corrosion, shortening the service life of the moulds and have an impact on the temperature stability. Before moulds and mould inserts are changed, the temperature-control channels are therefore blown out with compressed air. Traditionally, this is a manual process that not only takes a lot of time, but also involves a residual risk, as compressed air often does not flow evenly through the ducts. In order to ensure greater efficiency and safety, ENGEL has extended the functional scope of the premium version of its e-flomo electronic temperature control water manifold system to include automated sequential blowing out of the manifold circuits. "By blowing out automatically, we can extend the maintenance intervals for the mould and reduce maintenance costs," says Schütte. "A further benefit results when mounting the mould. The new feature ensures optimum venting of the temperature-control channels, ensuring premium part quality from the outset."



## Far more than pick and place

As a specialist for pools and pool accessories, Steinbach walks on the sunny side of life. With more money being spent on leisure activities, Steinbach continues to expand. Although wholesale trade dominates business activities, in strategically important segments, the family business – headquartered in Schwertberg, Upper Austria – is manufacturing a growing number of products. Five years ago the company started producing the retail packaging of their pool chemicals products. Steinbach invested in a new, fully automated production facility and asserted itself in a market environment dominated by Asian suppliers.

"I don't know of any other factory in the world that operates with such a high degree of automation," says Michael Meister proudly during a tour of the new building. The owner of the engineering company Meister-Quadrat in Niklasdorf, Austria, is mainly responsible for the new manufacturing and injection moulding processes. Together with customer Steinbach, and injection moulding machine manufacturer ENGEL, also based in Schwertberg, he has tweaked all the parameters and broken new ground in order to optimally exploit efficiency potentials.

The proximity of the project partners to each other also contributes to the success story. Steinbach and ENGEL are two of the companies in Schwertberg with

the longest history of steady growth and continuous investment in the region. Only the railway line separates the neighbouring company premises.

### In-house production boosts safety

Wool was Steinbach's main business for a long time, until the handicrafts market declined at the turn of the millennium. While looking for a second foothold, they came across the pool sector by chance. "A stroke of luck," as Hannes Peterseil, plant manager in Schwertberg, recounts. The industry has "virtually skyrocketed" in recent years. From garden pools and inflatable products to pool technology and swimming pool chemicals for cleaning and disinfecting the pool water, Steinbach



offers the complete range of products for private pool owners via DIY stores, garden centres and discounters. A demanding clientele, because safety is more important than fun when taking a swim. This is why Steinbach has produced the retail packaging for its pool chemicals since 2015 and now started filling in-house as well. Above all, chlorine products for water disinfection, such as chlorine tabs and chlorine granulate, as well as liquid algaecides, place very high demands on the containers. "We developed our own packaging design and even our own innovative child safety lock," says Peterseil. "With in-house production and filling, we have total control over the quality of our products and facilitate the safe storage and use for pool owners". On top of this we have gained more flexibility. In-house manufacturing enables us to offer customized products for retail chains also in small batches and still be cost-efficient.

In addition to the chlorine products, cleaning agents, algae removers and pH value balancers are filled in Schwertberg. Three different plastic containers are produced: round cans and bottles made of polyethylene, each sealed with screw caps, and rectangular buckets with snap-on caps made of polypropylene. In recent years, two blow moulding machines and three ENGEL e-motion injection moulding machines were purchased for this purpose. The plastics processing department now has its own production floor in the new, fully automated production and logistics building – 300 metres from the headquarters – which is one storey down from the filling department and connected to the high-bay warehouse next door. From the delivery of the raw materials through to dispatching the palletised end products, the complete flow of goods has been

automated. "As a result of the new building, we have tripled our capacity here in Schwertberg", says Peterseil.

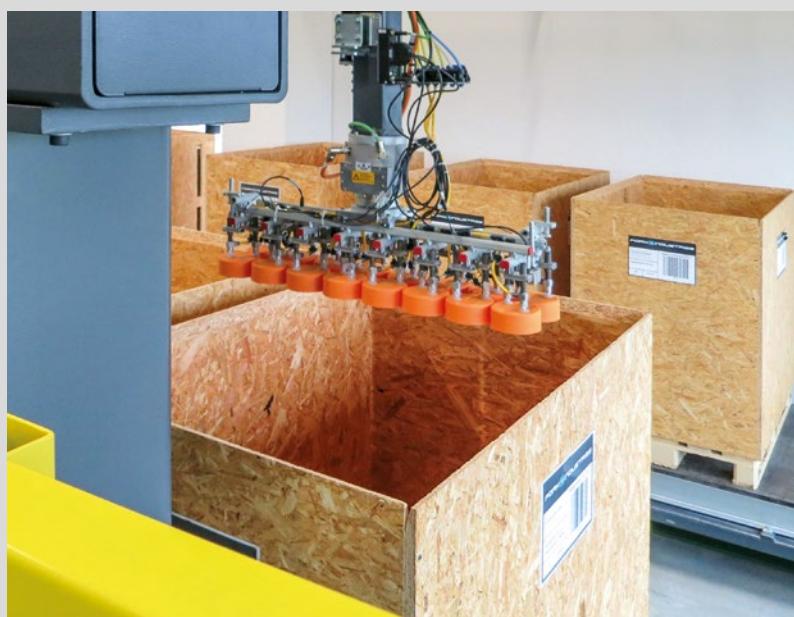
### viper robot communicates with warehouse management

Although modestly positioned at the end of the production floor behind the injection moulding machines, the stand-alone viper 40 linear robot supplied by ENGEL for the new building plays a key role in the overall automation strategy. It connects the two e-motion machines used for producing the container caps with the high-bay warehouse. "We have taken a totally new approach here", says Meister. "After all, palletising tasks are something that linear robots are normally not expected to handle. And it is true that Steinbach also initially envisaged an articulated robot in the concept planning. "But we would not have achieved our efficiency objectives", Meister objects. The linear robot is cheaper, needs less space, is easier to operate, and even faster when it comes to stacking. We now have the simplest, most efficient and most cost effective solution. Linear robots open up far more options than many processors believe."

Deborah Lidauer, product manager for automation at ENGEL, confirms: "Usually, the viper linear robot would be installed on an injection moulding machine, but there are even more examples in the market for stand-alone vipers used in the downstream processes to significantly increase efficiency". For these applications, ENGEL uses a separate frame or pedestal to mount the linear robot to absorb the dynamic energy. At Steinbach, the viper 40 was also equipped with the longest available Z axis.



*ENGEL viper stand-alone version: In combination with the transverse carriage (on the left in the photo), the robot connects the injection moulding production with the high-bay warehouse. Every ten seconds the viper robot reports the current quantities to the warehouse.*



*The viper stacks the caps in crates.*

**"Only few processors leverage the full potential of linear robots. My goal is to change that. They can do far more than pick and place, also in applications not involving the injection moulding machine."**

*Michael Meister, Meister-Quadrat*

Programming the software turned out to be trickier than the mechanical implementation. ENGEL's automation experts developed a solution specifically tailored to the range of requirements, including interfaces to warehouse management. In addition, ENGEL equipped the stand-alone robot with one of the first new C10 generation hand-held units, although the C10 was not due to be launched until months later. "The particularly large 10" touch display offers an even clearer layout and simplifies operation considerably. This is a massive advantage for the palletising tasks at Steinbach", says Lidauer.

## Production 24/7

Operating the stand-alone robot is not an additional challenge for the plastics engineers as the injection moulding machines are also equipped with ENGEL viper robots. The viper robots installed on the e-motion machines remove the container caps from the mould and deposit them on conveyors that run above the clamping units. The round caps are produced in a four-cavity mould, the snap-on caps in a 1+1-cavity mould including a handle, which is pressed into the cap by the viper robot immediately after injection moulding. At the end of the conveyor belt, the stand-alone robot alternately picks up 16 round caps and four snap-on

caps and sorts them into boxes. The parts are separated by layers of cardboard autonomously picked from a stack and placed by the viper. The packaging design was standardised to avoid the viper having to change the gripper

for each of the various tasks. "We made sure that the various containers fit the pallet dimensions", Meister explains. "The buckets have a footprint measuring 192 to 192 millimetres, while the round containers have a diameter of 96 millimetres. Four round containers fit in the footprint of a bucket, and all the caps also fit into this grid."

Every ten seconds the viper robot transmits the current quantities to the high-bay warehouse, reports full boxes and requests empty ones. A transverse carriage automatically transfers the boxes. The stand-alone robot transfers up to 50,000 parts a day from production to the new high-bay warehouse, which is one of the largest in Austria with 60,000 pallet bays.

Steinbach is moulding parts continuously. The night and weekend production is unmanned. Mould maintenance and rare mould changes are carried out on weekdays in two shifts with one operator each. There are time buffers for manual interruptions both on the injection moulding machine and the stand-alone robot. This means that production runs 24/7.



*Steinbach tripled its capacity with the new building in Schwertberg. Plastics processing now takes place on a separate production floor.*



*The container caps – both round and square – are produced on two adjacent e-motion machines, which are also equipped with viper robots.*



## Fast service included

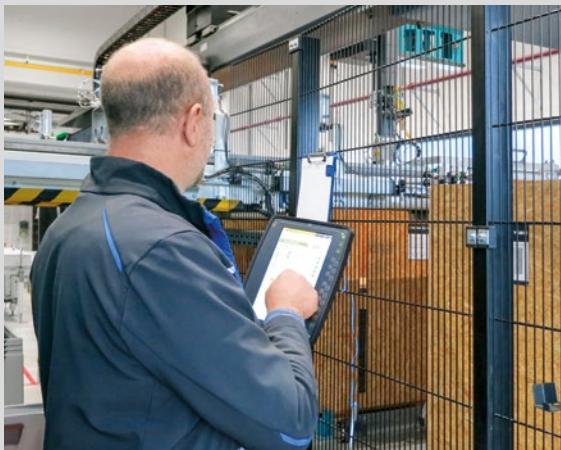
Quality and efficiency are the key factors that help Steinbach to successfully assert itself in the face of international competitors in the price-sensitive leisure market. Even though the company is doing much of its business internationally, it relies on regional partners. Apart from the machines, the moulds are made in Austria as well. The suppliers are HWB in Horitschon

and Glatzer in Fischamend near Vienna. And there is a bonus for being ENGEL's neighbours on top. "When we send a service ticket to ENGEL, the technician sometimes arrives just 20 minutes later", says Hannes Peterseil. "We get excellent technology and the fastest-possible service from ENGEL. We have the world market leader right on our doorstep. And, of course, we use this benefit."

(Picture: Steinbach)



Swimming pool chemicals, especially chlorine products, place particularly high demands on the containers. The design developed by Steinbach enables very safe handling of the products while at the same time ensuring highly efficient production.



Steinbach is one of the first users of the new C10 hand-held unit by ENGEL. Michael Meister from Meister-Quadrat demonstrating the benefits offered by the particularly large next generation display in stand-alone robot operations.



Exploring new approaches to automation: Hannes Peterseil, plant manager at Steinbach in Schwertberg, Klaus Mittmannsgruber, area sales manager Central Austria at ENGEL, Deborah Lidauer, product manager automation at ENGEL, and Michael Meister, owner and managing director of Meister-Quadrat (from left to right).



# Showing our colours – closing material cycles

At ENGEL, we embrace responsibility, helping our customers achieve sustainable injection moulding production. At the heart of this are our inject 4.0 solutions for the smart factory, which also open up new opportunities for the Circular Economy. For instance, the iQ weight control software balances out process fluctuations when processing recycled material. Consistent high part quality increases the range of possible uses for the recycled material.

Technologically, we are also promoting increased use of recycled material. With the new ENGEL skinmelt process, we are enabling a high proportion of recycled material even in complex component geometries.

The bottom line: green is more than the colour of our machines. Check out our inject 4.0 smart solutions and contact us today.



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