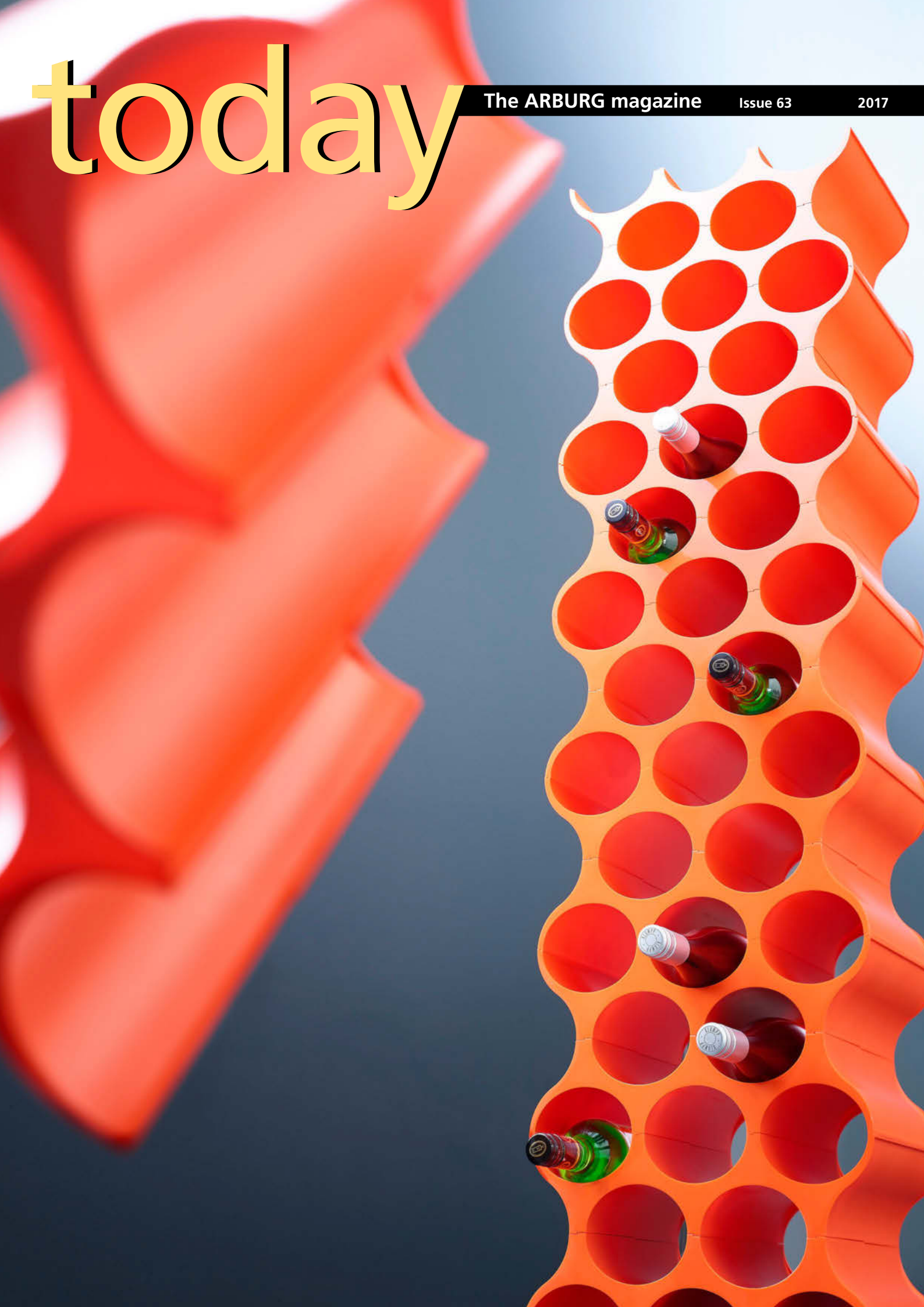


today

The ARBURG magazine

Issue 63

2017





4 Brand promise: Wir sind da. ... present where our customers are

6 Technology Days: First-rate industry event

7 koziol: Commission opts for ARBURG machines



10 BMW parking aid: Two-component rotary table machine produces two million connectors per year

12 Blue Metal: Latest processes and technologies always in focus



14 Louvrette: Automation shortens cycle time by around 25 percent

16 Powder injection moulding: First PIM smartphone housing worldwide



17 freeformer: User Day 2016 shows current state of development

18 ROS: Fibre direct compounding reduces costs and part weight



20 Widex: Components for innovative hearing aids produced on ALLROUNDERS

22 Subsidiaries: ARBURG celebrates anniversaries and inauguration of subsidiary in Taiwan



24 Mines Douai graduate school for engineering: New materials and applications for the freeformer

26 Tech Talk: Quality assurance for mould temperature control

IMPRESSUM

today, the ARBURG magazine, issue 63/2017

Reprints, including excerpts, only with express permission

Responsible: Dr. Christoph Schumacher

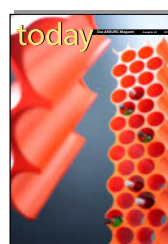
Editorial advisory board: Oliver Giesen, Juliane Hehl, Martin Hoyer, Jürgen Peters, Bernd Schmid, Jürgen Schray, Wolfgang Umbrecht, Dr. Thomas Walther, Renate Würth

Editorial team: Uwe Becker (text), Andreas Bieber (photos), Dr. Bettina Keck (text), Markus Mertmann (photos), Susanne Palm (text), Oliver Schäfer (text), Peter Zipfel (layout)

Editorial address: ARBURG GmbH + Co KG, Postfach 1109, 72286 Lossburg, Germany

Tel.: +49 7446 33-3149, **Fax:** +49 7446 33-3413

E-Mail: today_kundenmagazin@arburg.com, www.arburg.com



koziol creates high-quality products in an unmistakable design. The company has opted for an ARBURG turnkey system for the production of modular bottle racks.





Dear readers,

We communicated our brand promise "Wir sind da" for the first time at the K 2016. In the current issue of "today", we now explain to you precisely what it stands for. "Wir sind da." means: We are always present for our customers, wherever they need us: in technological and geographical terms. We will be providing proof of this with our Technology Days 2017, during which we will present our product range and the future of plastics processing to thousands of international visitors.

In the articles of this issue, you will also find out how our customers from around the globe are already preparing for tomorrow with our flexible and efficient turnkey solutions and our innovative processes and applications. In the research interviews, the first-class support and expert consulting that ARBURG provides was emphasised again and again. This proves that our

brand promise "Wir sind da." is in fact nothing new, but has been practised around the world by the 2,700 members of the ARBURG family on a daily basis for many decades.

This is the result of the continuous, long-term and successful establishment and development of our international sales and service network. Accordingly, there is always something to celebrate: we report on last year's inauguration and anniversary events in the current issue. In 2017, we are pleased to be marking six anniversaries: there will be celebrations in Belgium, Hong Kong, Malaysia, Mexico, Poland and the US. So you see, even after the K year, the schedule is more than busy!

I hope you enjoy reading our new issue.

Renate Keinath
Managing Partner



**QUALITY KNOW-HOW
MACHINES TECHNOLOGIES**

THE HOME OF INJECTION MOULDING

**MARKET LEADERSHIP
PASSION VISION
INNOVATION**

WIR SIND DA.

Wir sind da.

... present where our customers are!

Surprise, astonishment, speculation, explanation, understanding, recognition. These were the six steps the visitors went through at the ARBURG exhibition stand during the K 2016 when they were confronted with the slogan "Wir sind da." written large on the stand - wherever they looked. ARBURG took advantage of the leading international trade fair for the plastics industry to conspicuously and impressively present its brand promise.

There was much surprise, because the industry had been waiting in feverish expectation to discover what surprises ARBURG had in store. Of course, the visitors did expect new products, but not a new brand positioning initiative. This confident presentation of the brand created quite a buzz in addition to the product innovations such as the ALLROUNDER 1120 H with its new GESTICA control system and brand new, eye-catching design.

Brand promise in German

Astonishment and speculation then set in at the second glance: the statement "Wir sind da." was ubiquitous ... in German! Was this a mistake? Had those responsible at this leading internation-

al trade fair, where the international lingua franca is naturally English, forgotten to have the slogan translated? Not at all. As the explanation which immediately followed showed, leading as it did to understanding and recognition.

Lasting values

"Our new brand promise 'Wir sind da.' formulates the values for which ARBURG has always stood: we are uncompromisingly committed to the interests of our customers, employees and partners, everywhere and at all times," explains Managing Partner Juliane Hehl, who is responsible for Marketing. She goes on to explain that ARBURG chose the German formulation following extensive considerations because ARBURG is a globally acting, but nevertheless German, family-run company which supplies the world market with outstanding technology "Made in Lossburg".

"Our customers have known for decades that as in a well-functioning family, there is always someone there for you – in geographical, technological, mental and physical terms! The promise thus explicitly formulates what has always characterised us and has made us unique – and for which we are known and valued," says the Managing Partner.

Long-term promise

"The ARBURG brand offers a long-term promise that stands for quality, reliability and personal proximity, and one that we make on a daily basis. We reach out to our customers – wherever they're located! Now we are demonstrating this outwardly in an ever stronger way and would thereby like to create even greater identification with and trust in our company."

"For us, it is of course absolutely clear," adds Dr Christoph Schumacher, Head of Marketing and Corporate Communications, "that we must make this market positioning – formulated in German – known around the world, explain it and back it up with content. "Whether in advertisements, in the Customer Center at our headquarters, in one of our international subsidiaries, or at the customer's premises: the family-run company ARBURG is always there whenever and wherever it is needed, he goes on to say.

The customers see this in exactly the same way – this was demonstrated by the extremely positive response at the K 2016 and at further international trade fairs following the leading international exhibition.

NETWORKING
INDUSTRY 4.0 INNOVATIONS
HIGH-TECH THE HOME OF INJECTION MOULDING
TECHNOLOGY DAYS
EXPERT KNOWLEDGE 50 EXHIBITS
INDUSTRY EVENT EFFICIENCY ARENA
INTERNATIONAL CHARACTER

A must every year!

Technology Days: First-rate industry event

From 15 to 18 March 2017, the Technology Days will once again open its doors. Since 1999, this international industry event is a must for customers and those interested in the ARBURG technologies. More than 50 exhibits will be on view in Lossburg, innovative applications, the Efficiency Arena on the topic of Industry 4.0, expert presentations, company tours, individual discussions and much more.

The exhibits cover the entire spectrum of ALLROUNDERS and freeformers, including innovations and further developments. With sophisticated applications from all industries, the high performance of the ARBURG machines will be impressively demonstrated.

The "biggest" (quite literally) highlight will be the ALLROUNDER 1120 H featuring a clamping force of 6,500 kN, new design and the new GESTICA control system. The technology days will offer visi-

tors an opportunity to examine the new machine and control system generation, which was on show for the first time at the K 2016, in a relaxing atmosphere, away from the hustle and bustle of the trade fair.

New machines, Industry 4.0, turnkey expertise and more

With the production of folding step stools in an ARBURG design, the exhibit is also an example of ARBURG's competency in turnkey solutions. Further examples include fully automated production of the ARBURG watch from two LSR components, as well as current customer turnkey systems.

The entire spectrum of automation solutions from the INTEGRALPICKER and MULTILIFT robotic systems through to six-axis robots will also be exhibited.

At the Efficiency Arena, ARBURG will, jointly with partners, illustrate various aspects of Industry 4.0 based on the ex-

ample of a process chain with spatially distributed stations.

Expert presentations will cover topics such as lightweight construction, turnkey systems, ARBURG Plastic Freeforming and Industry 4.0. Moreover, renowned customers will present the benefits that the ARBURG machines provide to them. The presentation of the Service department with its spectrum and innovations as well as plant tours offering exciting insights, complete the programme.



At the Technology Days 2017 in Lossburg, the visitors will be able to view some 50 exhibits and innovative applications.

Turnkey for design

koziol: Commission opts for ARBURG machines

The name koziol stands for the extraordinary. koziol >> ideas for friends GmbH has been inventing, creating and manufacturing high-quality household and lifestyle products in unique designs since 1927. Located exclusively at its German plant in Erbach, in the middle of the Odenwald region, koziol describes itself as a manufactory. And this corresponds to the manner in which their production works.

The emphasis is on fast product changes, small unit volumes and, above all, very

thick-walled plastic parts with appropriately long cycle times. Can this be automated? It has to be, in order to remain competitive at the international level, say the decision-makers at koziol. And this is achievable – with turnkey systems from ARBURG.

Every spring and autumn, koziol launches between 25 and 40 new products onto the international market at the relevant specialist trade fairs. Around 14,000 injection moulds are stored at an in-house warehouse, of which about 500 are in constant use. The mould construction shop frequently works with master moulds in which different mould inserts can be integrated.

This type of production requires high flexibility of the systems employed.

SELOGICA convinces

During the course of an extensive information gathering phase, a machine-finding commission at koziol investigated the approaches to automation of various manufacturers in detail. This ultimately led them to opt for a turnkey system built around a hydraulic ALLROUNDER 630 S with a clamping force of 2,500 kN and a KUKA six-axis robotic system. ARBURG's big advantage: the programming of all sequenc-

es can be carried out simply and quickly via a separate hand-held operating unit which uses the familiar operating principle and symbols of the SELOGICA control system. Integrated operation is achieved thanks to a common data set for the machine and robot. The extended real-time connection between the SELOGICA and robot enables fast cycles and permits numerous synchronous movements. During the execution of standard operations such as separating, moving to the home position, as well as during the creation of individual sequences, the high degree of integration provides a high level of functionality.

Flexible turnkey system

By way of example, the system was tested with the production of a modular bottle rack. This is so flexible that it can be quickly converted by changing moulds and robotic grippers to permit the production of other moulded parts.

The koziol specifications included the ability to implement a wide range of downstream equipment, unmanned shift operation and stacking the parts from floor level up. In the case of the bottle rack, the downstream stations included labelling with a logo and EAN code for a POS scanner, as well as the fastening together of four of the modular units with straps.

The rack comprises four identical parts. These are removed from the mould by means of a vacuum gripper on the ejector side, whereby the parts from the first three cycles are stacked on a gripper station. Here, every second rack module is rotated through 180 degrees. In the fourth cycle, the part is labelled on both sides via a label printer and dispenser. Presence of the labels is checked using an optical sensor. The robotic system moves consecutively to these stations. The complete stack of four units is then lifted by the robot, transported to a wrapping station for bundling the bottle rack units and, upon a start signal issued there, fastened together with two



Photos: Koziol

plastic straps. The robot then sets down the stack onto a conveyor belt. In future, the bottle racks will be packaged in polybags and then several of these bags will be packed into cardboard boxes.

The six-axis robot sequences can be programmed simply and quickly thanks to the SELOGICA user interface.

Excellent experiences with ARBURG

During the selection phase, koziol had the best experiences with the primary contractor ARBURG. Above all, the preliminary training, the detailed planning and implementation, as well as commissioning of the entire system, including the sequence programming, mould and components provided, at the Lossburg parent factory made an excellent impression during the one-and-a-half-year implementation phase.

INFOBOX

Company: koziol >> ideas for friends GmbH

Founded: 1927 by Bernhard Koziol

Location: Erbach/Odenwald

Divisions: High-quality designer household and lifestyle products, precision moulds

Employees: 180

Industries: Consumer goods for international specialist retailers, special fabrications for industry and the promotional materials business

Products: kitchen aids, tableware, bathroom accessories, lighting, decorative articles

Machine fleet: 30 machines, of which twelve ALLROUNDERS with clamping forces from 500 to 4,000 kN

Contact: www.koziol.de



Interview

Michael Kredel,
Head of Application
Technology at koziol



today: Why did you opt in favour of an ARBURG turnkey system with a six-axis robot?

Kredel: We wanted a complete, flexible solution from a single source, which also included all the special equipment. The programming language for the robot and machine had to be standardised and simple, with the same symbols, because we wanted to keep the programmers and operators on board: we wanted them to enjoy working with the systems. Moreover, a six-axis robot can operate very flexibly and with larger handling heads than a linear robotic system for the labelling of numerous different moulded parts directly on the machine.

today: Have you already had experience with linear robots in automated production?

Kredel: At our production facility, we've had 22 injection moulding systems in operation with seven different linear

handling systems and the corresponding different programming languages, plus one industrial robot. The technicians got on well with the various manufacturers, except in the case of the six-axis industrial robot, the sequences of which were very difficult to understand and execute owing to the particularly complex language.

today: How did you proceed during your benchmarking?

Kredel: We tested three suppliers who are able to program the six axis robots with their injection moulding machine user interfaces. We attended the relevant training sessions offered by each of them. A particularly key point was the ability to start the system at the press of a button. Our experience has shown that the language of the injection moulding machine usually has to be abandoned at some stage, for example during implementation of a special solution. The degree of integration between the six-axis robot, machine and peripherals was the highest at ARBURG. It is precisely for these reasons that we finally chose ARBURG.

today: How have your experiences been so far?

Kredel: The new turnkey systems are accepted just as well by our technicians and operators as the linear systems. Moreover, ARBURG and its system partner fpt Robotik as a robotics specialist were always very open to our special requests.

The modules for the bottle rack are removed by six-axis robots and stacked in groups of four units.

Because for us, it's not just the price, but also the technology and support that are decisive when making a purchase decision, we felt we were in the best hands with ARBURG. Here, we had a single central contact who took care of all of our issues and carried out commissioning in advance at his company's plant. Our principle of "Nothing is impossible" was adopted by ARBURG as a principle, which resulted in highly flexible systems for producing our fabrication-batch volumes of between 500 and 50,000 moulded parts. A further point was that, thanks to the common language between injection moulding machine and robotic system, a high degree of integration and availability was achieved. We will therefore continue to expand our automation sector together with ARBURG in the future.



Additional

BMW parking assistance: two-component rotary table machine

When manoeuvring into tight parking spaces in their 7 Series BMWs equipped with the optional "Surround View" feature, motorists receive assistance from four digital cameras (icams). Eight-pin connectors featuring liquid silicone (LSR) seals for protection against spray water and dust are responsible for reliable connection between the cameras and electronic system. H&B Electronic, based in Deckenpfronn, Germany, produces around two million of these icam connectors for Bosch each year on a two-component rotary table machine.

The cameras are installed in the exterior mirrors, front grille and tailgate, and show the surrounding area from a bird's eye view. The icam connectors provide the link to the central control unit. At the heart of the 8-pin connector, which features a positively bonded, moulded-on LSR seal, are four short and four long pins. During production, these are fed from stamping reels, automatically bent and inserted into a carrier component by a SCARA robot. The finished pre-assemblies are conveyed into the injection moulding cell on work-piece carriers.

H&B Electronic has extensive experience with delicate metal inserts and fully automated production processes.

The icam connector is the first product with an LSR seal. H&B Electronic enlisted ARBURG's expertise and application technology consulting for its entry into liquid silicone injection moulding.

Two moulds – one ALLROUNDER

Stephan Schöne, responsible for project planning: "A combination of two injection moulding machines would have been significantly less expensive. However, the precise positioning of the pins is of the greatest importance for us. Here, we've had extensive and very good experiences with rotary table machines. Combining two moulds on a single ALLROUNDER also dispenses with coordination problems. We consequently opted for a two-component ALLROUNDER 1500 T rotary table machine with size 30 and 100 injection units for the LSR and PBT components respectively."

For the sprueless production of the pre-moulded part, H&B Electronic built a 4-cavity hot runner mould. Connectors for two different camera variants can be produced thanks to a changeover slide. "For moulding-on the LSR seal, we use a thermally self-sufficient cold runner mould," explains Stephan Schöne. The mixing and dosing technology is supplied by Reinhardt Technik and the automation solution was im-



plemented jointly with partner fpt Robotik. The fully automated production cell is completed by a traverse handling system, three six-axis robots as well as two inspection stations and one tempering station."

Moulded-on rather than fitted seal

The precise positioning of four pre-assemblies in the mould is performed by a suspended six-axis robot. After over-moulding with PBT (GF 30), the pre-moulded parts are removed by a linear traverse handling system. The seal (LSR, Shore 40) is injected into the LSR mould from above in order to dispense with downstream assembly or bonding.

While handling of the next pre-mould-



eyes for parking

produces two million connectors per year



Stephan Schöne from Project Planning at H&B Electronic (photo on left) relies on a two-component rotary table machine for the production of icam connectors (top photo). These components for BMW park assistance systems are produced fully automatically (photo on right).

ed parts is performed, the material has a few seconds' time to vulcanise. In order to ensure that the seal is intact and the pin positioning is correct, a camera test as well as one electrical and two mechanical tests are performed simultaneously at four inspection stations. Reject parts are sorted according to fault type and removed into drawers.

Following gentle heat treatment in a paternoster tempering furnace for eight hours, a pressure compensating element is finally applied and ultrasonically welded on by a further six-axis robot. Flow measurement, camera inspection and cleaning follow, before the icam connectors are packaged in 18-unit magazines and removed from the cell. Some two million icam

connectors are produced each year in this manner. With expansion of the "Surround View" optional equipment to smaller vehicle series, this component promises great potential for the future.

INFOBOX

Name: H&B Electronic GmbH & Co. KG

Founded: 1984

Location: Deckenpfronn, Germany

Divisions: In-house development, mould construction and 3D measuring lab, expertise in injection moulding, stamping and automated assembly

Production area: 13,500 square metres

Employees: 320, of which eight percent in Research and Development

Industries: Automotive, medical technology, control technology

Products: Complex connectors, hybrid components, precision-engineered modules

Machine fleet: 29 ALLROUNDERS (one and two components, LSR)

Contact: www.h-und-b.de

Innovative excellen

Blue Metal: Latest processes and technologies always in focus



Photos: Blue Metal

ce

Blue Metal Precision Industry (Dongguan) Ltd. has only been in existence since 2013 and produces oral hygiene products. For its further development, the highly innovative company from China invests in research and development on a continuous basis. Here, new manufacturing technologies such as the ProFoam foaming process, powder injection moulding and additive manufacturing with the freeformer have been tested at an early stage.

The business segments in which Blue Metal is involved include clean-room production for oral hygiene products and precision parts made of metal. As a system supplier with its own development, mould construction and production facilities, the company provides support to its customers from Asia, Europe and North America, from product development through to the packaged end product.

Several hundred products

Blue Metal works very closely with ARBURG and produces several hundred different products using the injection moulding process. Its machine fleet includes hydraulic, hybrid and electric injection moulding machines. The majority of

With ALLROUNDERS in the clean room (top and bottom right photos), Blue Metal manufactures the components for electric toothbrushes and oral irrigators (centre photo). Prototypes are produced on the freeformer (bottom left photo).

these are ALLROUNDER GOLDEN EDITION machines with robotic systems for moulded part removal.

High quality, precision and hygiene

Andy Sze, founder and Managing Director of Blue Metal, explains the reasons: "All moulded parts that we produce on the ARBURG machines meet the high expectations that we and our customers share with regard to quality and precision. The ALLROUNDERS are very reliable and durable, and they operate extremely efficiently with a high output."

In addition to quality and precision, adherence to high standards of hygiene is required. Consequently, both injection moulding itself, as well as the downstream operations such as assembly, printing and packaging take place within the 9,000-square-metre, GMP-certified clean room. Furthermore, special features such as water resistance and tightness must be assured, particularly in the dental products sector.

In addition to the innovative technology, Blue Metal appreciates ARBURG's customer-oriented consulting and services. Andy Sze adds: "ARBURG has always understood which of our products need what processing technology and has provided the best solution for the application at hand."

freeformer shortens development time

Innovative processes such as ARBURG Plastic Freeforming (APF) with the freeformer, the ProFoam foaming technique, as well as the powder injection moulding of metal components, have therefore already been implemented or are in the test phase.

Additive manufacturing is currently at the most advanced stage. Prototypes for design validation, for example, are produced on the freeformer. This shortens the turnarounds from development through to product by around 15 percent.

The ProFoam process is currently being tested on in-house moulds with the help of ARBURG specialists. The objective is to produce lighter, yet robust moulded parts and to improve cost-effectiveness by reducing the amount of material used. Using powder injection moulding, metal components are to be created in the tools and components segment for the machining of metals.

The innovative strength of Blue Metal was honoured with the "Customer Award 2016" by the ARBURG subsidiary in Shenzhen in the context of its ten-year anniversary (see page 23).

INFOBOX

Name: Blue Metal Precision Industry (Dongguan) Ltd.
Founded: 2013 by Managing Director Andy Sze
Location: Dongguan, Guangdong, China
Turnover: US\$ 10 million
Employees: Approximately 300
Products: Electric toothbrushes and oral irrigators, precision tools for metal machining
Machine fleet: 30 injection moulding machines, including 16 ALLROUNDERS with clamping forces from 500 to 2,500 kN
Contact: andy@catchup-plastics.com

Beautiful packaging

Louvette: Automation shortens cycle time by around 25 percent

Louvette GmbH from Kierspe, Germany, is a globally known system supplier for cosmetics packaging and values the same approach as that adopted by ARBURG. A hybrid ALLROUNDER 470 H in conjunction with the fast, dynamic mould-entry axis of the MULTILIFT V robotic system reduces the cycle times by more than 1.5 seconds per shot.

The product range, which comprises some 700 items, extends from standard packaging through to customer-specific containers in extravagant shapes. The packaging, which is produced in batch volumes of between 10,000 and several 100,000 units differs in particular with regard to finishing work and decorative enhancement.

Thick and thin-walled moulded parts

For the production of cosmetics jars, Louvette uses the injection moulding process for thick-walled parts and thin-walled inserts into which the creams are filled.



Production Manager Thorsten Koch is particularly happy with the cycle time reduction of around 25 percent.

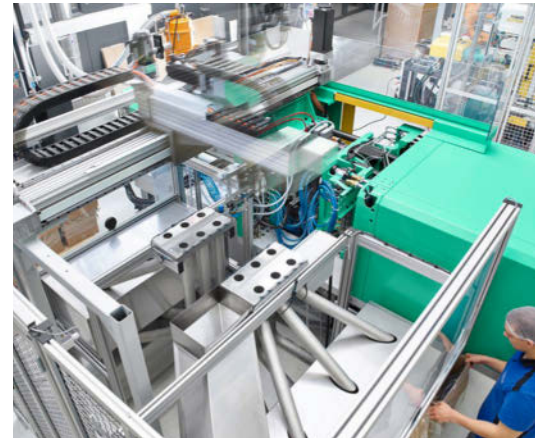
"There are aesthetic reasons for this," asserts Production Manager Thorsten Koch, "but also purely practical ones. Internal inserts made from PP are used because many of the contents can adversely affect the materials used for the outer jars."

Fast removal with MULTILIFT

Such thin-walled inserts with a shot weight of three grams are produced on a hybrid ALLROUNDER 470 H with a clamping force of 1,000 kN. The containers have a capacity of 50 millilitres and a wall thickness of 0.55 millimetres. A MULTILIFT V in cantilever design ensures fast part removal. With its vertical mould-entry axis, it moves into the 6-cavity mould and removes the inserts on the nozzle side. These are then passed to a dual set-down system on the left or right and ejected in a cavity-specific manner via tubes into cardboard boxes. Quality control is performed through visual inspection of parts produced during a manually separated shot. ARBURG supplied the machine, robotic system and set-down system from Barth Mechanik as a system solution, the hot-runner mould and grippers were built by Louvette's in-house mould construction.

Fast cycles, high transparency

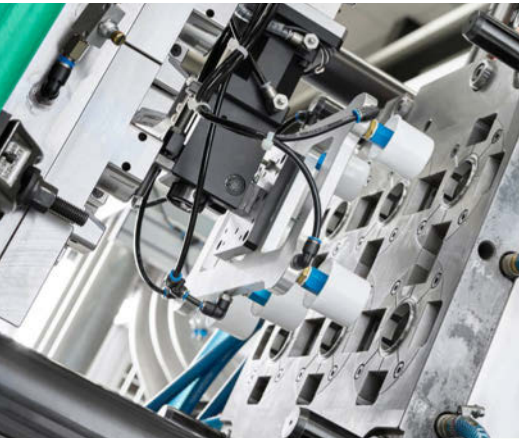
"Thanks to the ARBURG system for the inserts, we were able to reduce the cycle times significantly," explains Thorsten Koch. "This was further enhanced by the excellent dynamics of the hybrid ALLROUNDER with hydraulic injection. With this overall package, we've achieved a cycle time reduction of around 25 percent. This has meant an enormous reduction in costs, also through the precise traceability of the batches. This



means that in the event of problems, we no longer have to check or even dispose of entire production batches. Cycle time reduction was the main requirement, for which ARBURG was able to deliver a suitable, realistic solution."

Appropriate automation

Fabian Erhöfer, the son of one of the company founders and Managing Partner: "In our production, we recognised that we can only keep the complex interactions between materials, mould technology and temperatures under control within a stable cost/benefits window through manual, visual part inspections. So we only automate where this is really appropriate. And this was precisely the case with the ARBURG turnkey system."



The parts for the internal jars are set down according to the cavities (top left photo). The six parts are removed on the nozzle side (top right photo).



INFOBOX



Name: Louvrette GmbH

Founded: 1964 by Gerd and Dieter Erlhöfer

Location: Kierspe, Germany

Production area: Approx. 9,000 square metres, warehouse approx. 4,000 square metres

Divisions: System supplier for the production of high-quality cosmetic packaging

Employees: Around 175

Industry: Cosmetics

Products: Standard and individual jars, lids, bottles, pumps and airless systems for storing and dosing cosmetics

Machine fleet: 33 injection moulding machines, of which 28 ALLROUNDERS

Contact: www.louvrette.de



Brilliant PIM solution

Powder injection moulding: First PIM smartphone housing worldwide

Metal smartphone housings are generally machined. Powder injection moulding (PIM) offers significant cost advantages in comparison. To date, one obstacle to the injection moulding of thin-walled metal parts has been mould filling. ARBURG, jointly with its partner BASF, has implemented an innovative PIM application that solves this problem.

"The booming international smartphone market offers huge potential for powder injection moulding," says ARBURG's PIM expert Hartmut Walcher with conviction. Because this process enables the use of materials such as stainless steel, titanium and zirconium oxide, requires much lower material volumes and is significantly cheaper than machining.

At the leading industry trade fair, the World PM2016, ARBURG injection moulded thin-walled, stress and segraga-

tion-free smartphone backs made from metal powder for the first time worldwide, amazing the trade public in the process. A hydraulic ALLROUNDER featuring PIM equipment processed Catamold 17-4 PH Plus feedstock.

Temperature-controlled mould for high-gloss finish

The challenge during injection moulding of the green compacts with a thickness of only around one millimetre and a length of 136 millimetres is complete mould filling and minimising distortion during the subsequent sintering process. In order to maintain consistent green density over the entire part, the mould was dynamically temperature controlled. Through this measure, very good surface finishes have been achieved, which can subsequently be polished to a high gloss.

In future, the innovative smartphone mould will be used at trade fairs around

The low-cost powder injection moulding of smartphone backs implemented by ARBURG and BASF (high-gloss part on left, green compact on right) is unique in the world.

the world and will also be on view at the ARBURG Technology Days 2017. In addition to the smartphone backs, smartphone housing frames can be produced as closed or four-part frame options using the powder injection moulding process.

From experts to experts

freeformer: User Day 2016 shows current state of development

Today, leading companies and research institutes are successfully using the freeformer worldwide. In late November 2016, some 40 experts who work with the freeformer met for the third User Day in Lossburg. The main focus was on exchanging experiences regarding additive manufacturing. An important topic was material qualification in theory and practice. At the autumn trade fairs, the current progress of the freeformer and ARBURG Plastic Freeforming (APF) was demonstrated with the production of complex parts.

"There is clearly a great deal of mutual interest in the continuing advancement of the freeformer. Let's achieve further progress based on the experiences we have collected," Eberhard Lutz, ARBURG Director Sales freeformer encouraged the participants at the User Day 2016.

Improvements in theory and practice

At the expert meeting, presentations were initially held on improvements in process stability, e.g. through a homogeneously temperature-controlled build chamber, more wear-resistant discharge heads and optimised material feed. The theoretical fundamentals of data processing and a specialist presentation entitled "Material qualification in nine steps – from material preparation through to part production" followed.

In the afternoon, the participants had ample opportunity to try out what they had learned for themselves on three freeformers and discuss more in-depth questions with the experts. To round off the User Day, Dr. Eberhard Duffner, ARBURG's



Divisional Manager Development and Plastic Freeforming provided an outlook regarding the technology. Some of the innovations on which his team is currently working will be on show for the first time at the ARBURG Technology Days 2017.

In autumn, the APF team already presented interesting parts and applications at the K 2016 and formnext trade fairs.

Innovative APF parts

These include spacers made from the newly qualified high-temperature plastic PEI. A model of a toggle was produced in 200 hours of permanent operation from around 100 million droplets in a stable process, while a rope pulley made from organic polyamide impressed by virtue of its resilience and functional integration. The freeformer also demonstrates its potential in the context of a pioneering Industry 4.0 application: During spatially distribut-

At the freeformer User Day 2016, one of the speakers, Didier von Zeppelin (centre), Manager Additive Manufacturing at ARBURG, presented advances in ARBURG Plastic Freeforming (APF).

ed production in the "Smart Factory", it individualises "smart" luggage tags injection moulded in high volumes with a 3D graphic motif. The flexibly automated and networked process comprising injection moulding and additive manufacturing is an example of the efficient production of single-unit batches.

Long glass fibres instead of expensive

ROS: Fibre direct compounding reduces costs and part weight

Highly strong and resilient at reduced manufacturing costs and up to 30 percent lower weight in comparison to the expensive high-performance plastic PBT: Good reasons for ROS GmbH & Co. KG from Coburg, Germany to turn to fibre direct compounding (FDC) from ARBURG. The company uses this process to manufacture cable drive housings for power-window car doors from PP with 30 percent long glass fibres. Expensive pre-compounded granulate mixtures can be dispensed with.

ROS values ARBURG as an innovative manufacturer of injection moulding machines. The company has been operating with ALLROUNDERS since back in 1963 and was one of the first customers to participate in the development of the lightweight construction process FDC to production readiness.

FDC provides significant cost benefits

"We became aware of the new lightweight construction process at the Fakuma 2012," remembers Managing Director Steffen Tetzlaff. "At the time, we had new orders for cable drive housings and were thinking about potential ways of lowering our manufacturing costs. Because most of the mould technology possibilities had already been exploited, we examined the material costs in greater detail and recognised that FDC would offer us significant

benefits." Previously, ROS had been using comparatively expensive fibre-filled compounds. With FDC in contrast, standard PP granulate can be used. During the injection moulding process, inexpensive glass fibre rovings can be cut and directly added into the liquid plastic melt via a lateral feeder. The fibre length and proportion can be individually adjusted. In this manner, the mechanical part properties can be influenced in a targeted manner.

Housings require high quality

The quality requirements at ROS are high: in addition to dimensional stability, strength, in particular is required. 50 percent of the glass fibres (weighted) in the part must be longer than 1.0 millimetre. Moreover, the cable drive housings are subjected to durability tests and testing for grease and heat resistance before they can be installed in a variety of vehicle models by the OEMs.

Process optimised during test series

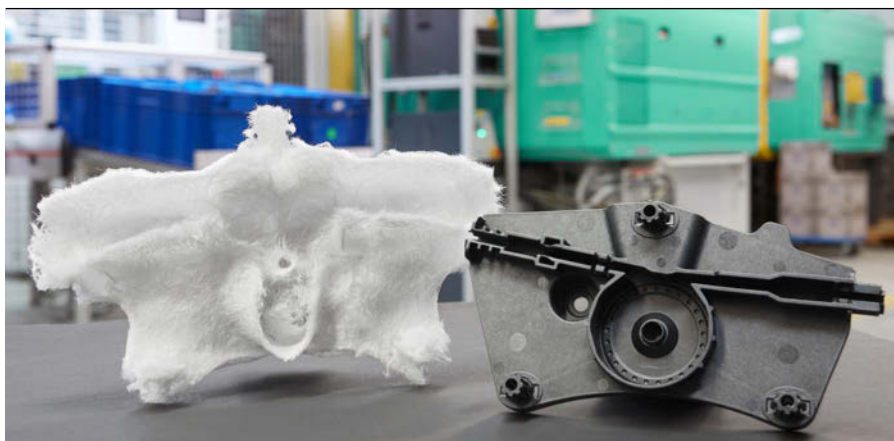
Initial testing for the FDC process began in early 2014. In order to optimise the process, four further test series followed. Here, the aim was, for example, to prevent fluctuations in the proportion of glass fibre, to wet the fibres evenly with plastic and to minimise the clumping of fibres. "The opportunity to use the Customer Center in Lossburg for application technology purposes offered us huge advan-



tages during the development work," says Steffen Tetzlaff regarding the excellent cooperation.

An ALLROUNDER 630 S with a clamping force of 2,500 kN and an FDC unit has been in operation since the spring of 2016. In addition to an adapted cylinder, this comprises a special screw and a lateral feeder with integrated cutting device.

Instead of expensive PBT



ROS Managing Director Steffen Tetzlaff (photo on left) produces fibre-reinforced cable drive housings on an in-house-built 4-cavity mould using the FDC process.

The glass fibres are cut and added via a lateral feeder (photo above). The homogeneous distribution of the glass fibres can be seen following incineration of the part (photo on right).

Long glass fibres with a length of 11.2 millimetres are fed via this unit.

Up to 30 percent weight reductions

The results speak for themselves. The cable drive housings made from 30 per cent fibreglass-reinforced PP, measuring around 200 x 100 millimetres and with a weight of 50 grams, are similar in toughness, strength and rigidity to comparable parts made from PBT. Moreover, they are up to 30 percent lighter than the previous PBT housings – and the cycle time is also shorter.

A 4-cavity mould built at the in-house mould construction shop is used. Direct injection with a pneumatic needle-type shut-off system is implemented. A linear robotic system removes the finished parts and transfers them to a weighing cell. Here, the component weight is checked

and documented as an additional quality criterion. Next, the good parts are automatically separated and set down into the transport packaging according to the cavity pattern.

"ARBURG is a reliable partner with whom we can plan internationally for the long term. In addition to outstanding service and support, the company's technological performance and expertise have impressed us," says Steffen Tetzlaff.

"The machine technology offers a very good price/performance ratio as well as maximum flexibility." In future, ROS intends to produce around 2.5 million fibre-reinforced parts a year on the FDC machine.

INFOBOX

Name: ROS GmbH & Co. KG

Founded: 1926 by Hermann Ros (Presswerk ROS), current Managing Directors Manfred Ros and Steffen Tetzlaff

Locations: Coburg and Ummerstadt, Germany and Most, Czech Republic (ROS Czech s.r.o)

Employees: Around 300 in Germany, a further 150 in the Czech Republic

Products: Cable drive housings, pump housings and impellers for the automotive industry

Machine fleet: 109 injection moulding machines, of which 58 are ALLROUNDERS

Contact: www.ros-coburg.de



Enabling better hea

Widex: Components for innovative hearing aids produced on

The products of Widex A/S, based in Lyngø, Denmark, and one of the world's largest producers of hearing aids, help people out of the negative spiral of poor hearing. Hydraulic, as well as electric and vertical ALLROUNDERS are used in the production of hearing aids.

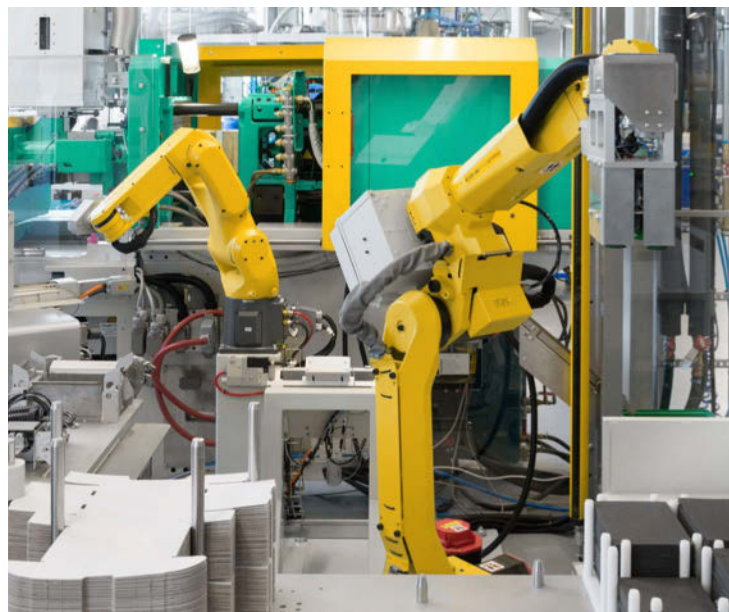
Housing halves for the electronics and batteries of the hearing aids which are worn behind the ear, for example, are produced on ALLROUNDERS with MULTILIFT SELECT robotic systems for sprue separation.

Fully automated overmoulding of inserts

The metal inserts for the inner workings of the hearing aids – such as pressure switches, volume controls and contact connections – are overmoulded fully automatically on vertical ALLROUNDER 275 V machines. Here, the components are unwound from a reel, overmoulded and wound up again. Assembly, which involves stamping, is mostly performed downstream.

An electric multi-component machine from the ALLDRIVE series is also used, on which thin tubes are

produced for transmission of the acoustic signals from the hearing aid to the ear. A hard PA12 is processed together with a softer PA6. The PA12 creates a permanent connection to the supply unit. The PA6, together with the TPE ear bud, ensures wearing comfort. Both items are removed via a MULTILIFT SELECT robot equipped with a special gripper.



The smallest part weighs 0.0027 grams

The smallest item produced measures 0.63 x 0.55 millimetres. Its volume is 0.00195 cubic centimetres, its weight 0.0027 grams. For the production of micro parts of this type, all of the ALLROUNDERS feature at least eight freely programmable inputs and outputs, as well as up to eight pneumatic core pulls for controlling special processes, for example the feed process for the metal inserts on the strip. Here, the benefits of the SELOGICA control system

are exploited as all the operations can be integrated in the sequence.

ALLDRIVE for high precision

On the development of the machine fleet, Lars Molander, engineer for plastics processing at Widex, says, "For around six years, we have been exclusively purchasing electric ALLROUNDERS from the high-performance ALLDRIVE machine series because we value the high precision of the mould and injection movements.



ring

ALLROUNDERS



Photos: Widex

Widex produces its hearing aids (top photo) in Lyngø, Denmark, CO₂-neutrally (photo on right). Some of the components are produced on fully automated turnkey systems (photo on left).

The MULTILIFT sprue picker is fully integrated in the SELOGICA control system. In the case of the vertical ALLROUNDER V, Widex uses a special software in conjunction with the SELOGICA control system, which, in turn, actuates an in-house-developed picker for separating the sprues."

Specifically adapted automation

The cooperation between Widex and ARBURG dates back to 1969. Lars Molander says, "We were and remain highly satisfied with the ARBURG services, the company's flexibility and the manner in which the equipment of the ALLROUNDERS can be adapted to our specific needs, particularly in terms of au-

tomation. This is why 34 of our total of 36 injection moulding machines at Lyngø are ALLROUNDERS."

INFOBOX



Name: Widex A/S

Location: CO₂-neutral production at the headquarters in Lyngø, Denmark, further production location in Tallinn, Estonia

Employees: More than 4,000 worldwide, 850 of which in Denmark

Industries: Health, medical technology
Products: Small technical plastic parts for innovative hearing aids and hearing devices, global market share of around 10 percent

Machine fleet: 36 injection moulding machines in Lyngø, of which 34 ALLROUNDERS

Contact: www.widex.com

Big celebrations in

Subsidiaries: ARBURG celebrates anniversaries and inauguration



Fully owned subsidiary in Taiwan

On 22 September 2016, the official inauguration of ARBURG's Taiwanese subsidiary was held in Taichung. Its offerings were presented live to the 150 invited guests in the presence of a high-ranking delegation from the German parent company.

"The foundation of a fully owned organisation is a significant milestone of the company's successful development in Taiwan, where we were represented in excellent fashion by C & F International Corp. for 35 years," said Managing Partner Renate Keinath. The objective, she continued, is to secure and strategically expand the company's presence in this important and innovative market with the subsidiary.

With Michael Huang, a plastics specialist is heading the subsidiary team which includes experienced sales and service staff.

The Managing Director Sales, Gerhard Böhm, explained the offerings: "Our subsidiary in Taiwan offers high-end technology, pre and aftersales services and comprehensive expertise on an area of 550 square metres. The showroom serves as both a presentation forum and a contact point for customer testing. Spare parts can be supplied promptly and four comprehensively trained service technicians are on hand to ensure fast assistance on site." In future, ARBURG will continue to develop its infrastructure in Taiwan, including extended service offerings and application technology consulting.

Inauguration ceremony: Renate Keinath (3rd from left), Managing Partner, Michael Huang (2nd from left), Managing Director of the ARBURG subsidiary in Taiwan, Gerhard Böhm (2nd from right), Managing Director Sales, Andrea Carta (3rd from right), Director of Overseas Sales, Georg Anzer (left), Director of Human Resources Management, and Hazel Liu (right), Head of Finances in Taiwan.

Asia!

of subsidiary in Taiwan

Ten years of ARBURG Indonesia

On 18 November 2016, the ARBURG subsidiary in Jakarta celebrated its ten-year anniversary with 50 invited guests. At the time, ARBURG was the first European injection moulding machine manufacturer with its own subsidiary in Indonesia.

As a representative from the parent company, Regional Sales Manager Rainer Kassner thanked the customers for the trust they place in the company and the entire ARBURG team for their great commitment in the name of the Managing Partners and Management Team.

The highlight of the evening celebrations were the traditional "Tumpeng" thanksgiv-



Anniversary award: Rainer Kassner (left), Regional Sales Manager, presented the "10 years of ARBURG Indonesia" sculpture to David Chan (right), responsible for the ARBURG organisations in the ASEAN region.

ing ceremony as well as presentation of the anniversary sculpture to David Chan, who is responsible for the ARBURG organisations in the entire ASEAN region. Subsequently, David Chan and Subsidiary Manager Haryadi Mulyono presented awards to seven cus-

tomers, who were the first in their country to purchase, e.g. a liquid silicone, multi-component and cube-mould machine.

10 years of ARBURG Shenzhen

On 23 September 2016, the Chinese ARBURG subsidiary in Shenzhen invited some 200 guests to celebrate their ten-year anniversary in style during an exclusive evening event.

The Managing Director Sales, Gerhard Böhm, welcomed the guests and thanked the staff and customers for the "fantastic development over the past ten years". He attributed this success to the local team and above all to the customers, with whom the company has a very trusting and successful working relationship. Managing Partner Renate Keinath also expressed praise and presented

the anniversary sculpture to Zhao Tong, Managing Director of the ARBURG organisation in China, and his team in recognition for their great commitment.

The presentation of awards to selected customers in the categories "Greatest innovative strength" (see page 12), "Highest growth potential" and "Outstanding partnership" was followed by entertainment highlights and the presentation of LSR processing on the hydraulic ALLROUNDER GOLDEN EDITION machines.



Managing Partner Renate Keinath (2nd from left) congratulates Zhao Tong (left), Managing Director of the ARBURG organisations in China. Celebrating with them was Managing Director Sales Gerhard Böhm (right).

3D thinking require

Mines Douai graduate school for engineering: New materials and

The first international freeformer customer was the French graduate school of engineering, Mines Douai, where the students attend a Master's programme. Why? Because since autumn 2015, the plastics experts have been doing precisely what the open system has been designed for: configuring materials and applications precisely for industrial additive manufacturing.

Prof. Jérémie Soulestin directs the polymer group of the TPCIM (Technologie des Polymères et Composites & Ingénierie Mécanique) department at Mines Douai. His team's industry-related research activities include the development of materials with special characteristics and their optimal processing. In order to implement custom-made polymers and composite materials in innovative products, the laboratory has long included ALLROUNDER injection moulding machines in its machine fleet, as well as, since autumn 2015, a freeformer.



Exploiting the potential of APF

Since then, Prof. Jérémie Soulestin and his research assistant Dr. Sébastien Charlon have been working intensively with ARBURG Plastic Freeforming (APF). He describes his objectives as follows: "We don't simply want to develop new materials and optimise them in process terms, but also fully exploit the potential of the freeformer through new approaches in part and product design." In order to enter as deeply as possible into the operating principles of the machine and

software and understand the APF process in detail, the scientists conducted testing with the standard plastic ABS during the first months.

Initially, the aim was to understand the flow characteristics, the influences of part geometry and the behaviour of the tiny plastic droplets during their crystallisation. Only then can the component properties be influenced and analysed in a targeted manner to determine which materials are particularly well suited for the freeformer.

"We primarily opted for ARBURG's open system because it offers us many

possibilities to intervene in the process," explains the university lecturer. "Because, rather than limiting ourselves to a few dozen 3D printing materials, we want to select the materials that we work with."

Learning by doing

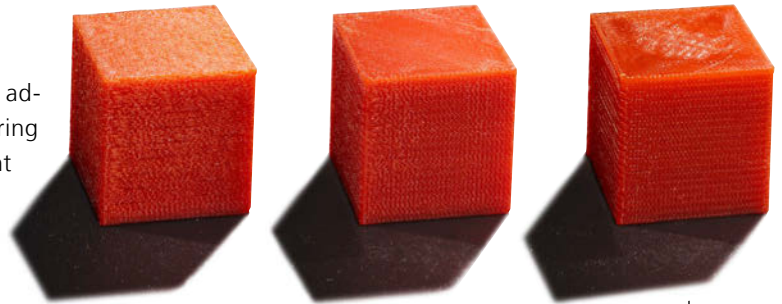
In a "learning by doing" process, hundreds of test cubes were "freeformed" using different process parameters and then measured and inspected. The expertise grows with each success and failure.

d

applications available for the freeformer



charge units for the additive manufacturing of multi-component parts in several colours and materials, including support structures.



3D printing for additional functionality

“As soon as an additively-manufactured product offers greater functionality and can be produced more cost-effectively than an injection-moulded one, we'll have achieved our goal. New technology, however, also requires new approaches. 3D thinking is required here.” says Prof. Jérémie Soulestin with confidence. In addition to the sports sector, he sees the greatest potential in the automotive industry, which is taking a great interest in additive manufacturing. In addition to spare parts, he expects the production of “3D-printed” high-volume parts that offer completely new functions within the next two years.

Prof. Jérémie Soulestin (right) and Sébastien Charlon from the Mines Douai Graduate School of Engineering have already produced hundreds of test cubes (photo above).

In the meantime, the range of materials has been expanded with special PA, PEI, TPE and various support materials. The next materials to be examined are polyolefins such as PP and PE, as well as technical materials such as POM and PEEK and special filled materials.

Several projects are currently running with industry partners, as well as doctoral dissertations. Owing to the high demand, the team would like to have a second freeformer at its disposal, preferably with a heated build chamber for PEEK processing and additional dis-

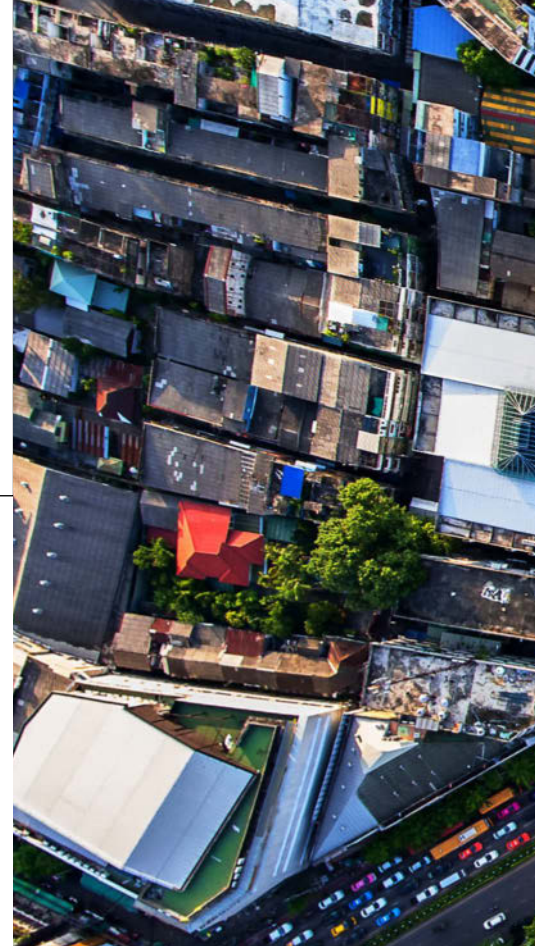
INFOBOX

Name: Ecole des Mines de Douai (graduate school of engineering)
Founded: 1878 for mining, graduate school for engineering since 1965
Location: Douai, France
Divisions: Research, material development, plastics processing, postgraduate engineering programme
Employees: 35 at the TPCIM institute
Machine fleet: Extruders, injection moulding machines, freeformer for additive manufacturing
Contact: www.mines-douai.fr



TECH TALK

Oliver Schäfer, Technical Information



Industry 4.0 in pra

Quality assurance during mould temperature control

Optimal production results require reliable temperature control of the moulds. They not only significantly influence the quality of the moulded parts, but also the achievable cycle time for an application. In order to set, monitor and regulate the temperatures more easily, IT networking and systematic data evaluation is required – in other words "Industry 4.0".

A significant requirement placed on modern machine control systems has for some years been that they act as a quality monitor for the entire injection moulding process. And they do so without increasing complexity. Numerous mould temperature control functions are already available for the SELOGICA control system, with which process parameters can be monitored and seamlessly documented,

as well as adaptively regulated. All these measures point the way to so-called "intelligent" machines (smart machines) in the digital factory – or, in practical terms, for higher production efficiency.

Regulating, monitoring and documenting temperature control parameters

A good example is the integration of mould heating circuits. Firstly, these can be actuated directly. Here, SELOGICA itself performs temperature regulation by adaptively adjusting parameters to the regulation behaviour of the mould heating circuits. Secondly, external hot runner control devices based on the standardised communication platform OPC UA can be connected (see Tech Talk today 62). This means that nominal temperature values for hot runners can be entered at the machine and stored in the data set. This fa-

cilitates operation significantly. The actual values can be permanently monitored by the machine control system and logged in table and chart form. A further feature are the device-specific "convenience functions" which enable ever more detailed process and quality control, e.g.:

- Monitoring of the switch-on time of hot runners and even distribution over the cycle
- Joint, multi-stage heating of mould and hot runner
- Boosting

With the integration of temperature control units in the control system, detailed parametrisation and monitoring can be implemented. This also ensures thermally stable processes and a high degree of reproducibility. As the temperature control unit measures flow rates, return and differential temperatures, faults – for



Photo: fotolia

ctice

example a kinked hose – are immediately detected and can be used for quality assurance purposes.

Integration of measuring equipment in the process

By equipping the cooling channels on the cooling water distributors of ALLROUNDERS with a flow and temperature measuring system, fluctuations in the cooling water supply can be automatically compensated. For this purpose, cooling water flow rates and temperatures can be optionally regulated automatically via the SELOGICA control system.

For individual online control, tolerance bands can be defined for each monitored cooling channel. The result here is also that interference variables such as clogged filters, deposits in channels and fluctuations in the cooling water supply

lose their influence on the part quality and production process.

Networking improves part quality

The existing mould temperature control functions impressively demonstrate that the catchword "Industry 4.0" involves much more than simply a vision of the "Smart Factory" of tomorrow. It much rather represents highly pragmatic solutions and modules. The ever more advanced IT networking and systematic data evaluation is often only the next logical step towards enhancing production efficiency and cost effectiveness. And the fact that this topic is gaining in significance is always the result of ever more sophisticated, high-performance information and communication technologies.

A roundabout – the symbol of a pragmatic solution through a self-regulating process.



QUALITY KNOW-HOW
MACHINES TECHNOLOGIES
**THE HOME OF
INJECTION MOULDING**
MARKET LEADERSHIP
PASSION VISION
INNOVATION

WIR SIND DA.

For as long as ARBURG has been involved with injection moulding, its aim has always been to be the home of the process. You won't find another company in the world that is dedicated to the development and perfection of injection moulding with the same level of consistency and commitment. We always have one objective in mind: your success.

www.arburg.com

ARBURG