

today

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IMPRESSUM

today, the ARBURG magazine, issue 66/2018

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Like all archery products made by Beiter, the arm guards are available in numerous colours: Produced on ALLROUNDERS and presented by Mix Haxholm, Miss Thailand 2003 and Thai Archery Champion 2005.





Dear readers,

I hope that you had a good start into the new year.

For us, January has involved intensive preparations for the Technology Days, when

we once again expect to welcome thousands of guests from around the world to Lossburg in March 2018.

As usual, one highlight of our industry event will be the Efficiency Arena, which this time will focus on the topic of Digital Transformation. You can find out how intensively we are concentrating on this important topic for the future across all departments in an interview with our experts.

After the Technology Days, in the second quarter of 2018, the major trade fairs around the globe will then follow thick and fast: the Chinaplas in Shanghai and the Hannover Messe in Hanover will be followed by the NPE in Orlando and the Plast in Milan. Everywhere, our motto will be "Wir sind da." – to present our existing and

prospective customers innovations, highlights and trends at local level.

Moreover, quite "incidentally", we will also be busy at home, whether working on the redesign of our machines or on the new GESTICA control system. But don't worry: as always, we will be proceeding step-by-step, so that you can always produce efficiently and reliably to a high level of quality with ARBURG technology.

In this issue, we will again be providing examples of this with interesting reports from a wide variety of areas. Find out, for example, where and how high-tech components for the world of international archery are created and how flexibility and automation can be combined in a customised turnkey solution.

We hope you enjoy reading our "today".

Renate Keinath
Managing Partner



“Industrie 4.0 – powered by Arburg“:
Divisional Managers Andreas Dümmmler and
Gerhard Würth, together with Managing
Directors Jürgen Boll and Heinz Gaub
(from left to right), are jointly driving forward
the digital transformation.

Photo: ARBURG / Adobe Stock

Top priority 4.0

Digitalisation: Consolidated expertise from a single source

Digitalisation is a top priority for ARBURG. Consequently, the Managing Directors Heinz Gaub (Technology & Engineering) and Jürgen Boll (Finance, Controlling & IT) are personally in charge of this topic – jointly with the experienced Divisional Managers Gerhard Würth (Technical Administration) and Andreas Dümmler (Information Systems). During an interview with the “today” editorial team, they explained the company’s strategy.

today: Other companies have a Chief Digital Officer. Why does ARBURG rely on a team for its digitalisation efforts?

Boll: For such a multifaceted and complex topic, a “one-man-responsibility” would be inadequate in our view. The message “someone is responsible for digitalisation” wouldn’t fit in with our approach. We’d like to drive the topic forward jointly in a synchronised and targeted manner, while also shouldering the responsibility together. We therefore rely on the many years’ experience gained by our specialists from Engineering, Sales and IT and their close cooperation under one roof.

today: ARBURG has already shown numerous practical examples of Industry 4.0. Does the “digitalisation” project go in the same direction?

Gaub: No, the topic goes much further than that. To ensure that the digitalised world is an opportunity and not a threat, it is important not to “rest” on the success of the established business model, but to explore new avenues. That’s why the digital transformation of a machine manufacturer like ARBURG is not a temporary project, but a comprehensive process of change in all functional areas.

today: How are the demands placed

on traditional working disciplines and interfaces changed thereby?

Gaub: Through the change towards digitally controlled business processes, virtually all the content of our work changes: from the initial enquiry for a product through to its delivery and long-term service support.

Boll: What’s important, therefore, is to get all the employees on board in advancing digitalisation so that their respective competencies can be utilised in a targeted manner. In future, the borders between the various departments will be largely imperceptible and tasks will be carried out where they can be processed the most efficiently.

today: And what specifically does the topic of digitalisation involve?

Dümmler: On the one hand, it’s all about the digitalisation of our own business processes, e.g. technical machine configuration and working with a digital twin, a virtual simulation of a real machine.

Würth: On the other hand, it’s all about the digitalisation of our own products and services to increase the production efficiency for our customers. One example here is the smart machine, which regulates itself to an optimal state and, thanks to various connectivity modules, becomes an independently communicating partner within the Industry 4.0 landscape, integrating itself appropriately into the production processes.

today: Do you have any current examples?

Würth: Of course. We’ve already been focusing on this topic for decades. Consequently, our digital spare parts ordering system has long been successfully in use, as has our in-house-developed MES, the ARBURG host computer system ALS, which brings the IT world into

production with web-based, mobile applications. Further offerings range from the new ARBURG Remote Service ARS and numerous assistance systems for starting, setting-up, optimising, producing and monitoring the machines, through to servicing. Our comprehensive offerings with regard to “Industry 4.0 – powered by Arburg” will be on view at the Efficiency Arena during the Technology Days 2018.

today: The topics of big data and security are the subject of a controversial debate. How does ARBURG regard the situation?

Gaub: What’s always decisive is that the extensive data is not only collected, but evaluated and used in a meaningful manner. Our motto is therefore “Smart data rather than big data!”. Security is the highest priority during all our activities, including those relating to digitalisation. Our customers can therefore rest assured that with us, their data is protected at all times.

today: What can we expect in the future?

Dümmler: In our future activities, the digital transformation will be based on four pillars: One relates to our internal processes, the other three are aimed at our customers. Of these, the first involves the direct machine and control system environment (smart machine). With the second, we operate in our customers’ world, i.e. in their production facilities with applications (smart production) and the third applies to platforms and wide-ranging digital service offerings (smart services).



Around the world, top archers such as Lisa Unruh, silver-medal winner at the Olympic Games 2016 in Rio, rely on accessories from Beiter.

Photo: Beiter

Setting its sights on visions

Werner Beiter: International leader in archery supplies

To visit Beiter in Dauchingen near Villingen-Schwenningen, Germany, is to immerse yourself deeply into the company's history – and thereby into the history of archery. You find out why, in this sector, Beiter is a brand name that boasts a similar level of international success as Adidas, Nike or Puma, and why all the reputable archers want to advertise for Beiter, even without any sponsoring. The visionary Werner Beiter really made a difference.

Founded in 1968, as a design office for plastic parts and injection moulds, Beiter has expanded continuously. There followed entry into the production of precision plastic

parts for the watch industry and medical technology.

After moving to its current headquarters in Dauchingen near Villingen-Schwenningen, company founder Werner Beiter dedicated himself to archery in the 1980s, initially in his free time. This soon changed, as his daughter and today's Managing Director, Nicole Beiter-Lorenz, recounts: "Archers frequently approached him asking whether, with his inventiveness in the field of high-precision products, he might also develop something made from plastic for

them. My father thought about greater precision in archery and after only six months, was already registering the first patent worldwide in this area."

Passionate inventor

Today, Beiter is doubtless the pre-eminent European manufacturer of archery accessories. All the products that the company has ever produced are "Made in Germany" and have endured in the range to this day. They are exported from Germany to around the world.

Werner Beiter has never done anything in half measures. When he starts something, it's always with full commitment. His research into the topic of

archery accessories has gone into great detail, initially for high-precision nocks and nock points for arrow ends and bows to enhance marksmanship. To this day, these components are at the centre of all the production activities. Nicole Beiter-Lorenz describes the special requirements that apply here: "Our main product – the worldwide-patented and market-leading Beiter nock – is produced on a mould with only one cavity. This allows us to meet minimal tolerances and ensure maximum precision. Multi-cavity moulds are therefore unsuitable for this

application. Our mould features interchangeable inserts to enable production of the numerous different sizes and versions required. For us, quality is simply more important than quantity."

To provide optimal test conditions, not only for the company itself, but also for the top-class archers, Werner Beiter built the "Werner & Iris Center", a testing and warehouse facility which offers the ideal conditions for archers. Here, the athletes can adjust their materials to best effect, try out new materials, or simply train. The hall is intended for the sole purpose of archery and even caters to the Olympic distance of 70 metres indoors.

Global elite meets at Beiter

The fact that the world's top archers all converge at the "Werner & Iris Center" in Dauchingen is no coincidence. Here, the technical equipment for precise configuration of the entire equipment is available: from adjustment aids and archery ranges free of environmental influences, through to high-speed cameras that capture the flight of the arrows with extremely high precision. The athletes therefore benefit in double measure from the "Werner & Iris Center": research in archery is advanced significantly here and they can also train under perfect conditions in Dauchingen. Consequently, the little village has gained a reputation worldwide.



Photos: Beiter

Precision parts on ALLROUNDERS

From the outset, Werner Beiter opted for ARBURG injection moulding technology for the production of his plastic parts. At the end of October 2017, the company procured a new hydraulic ALLROUNDER 170 S for its production facility. Production of the bow accessories, mostly as inserts and free-falling parts in unit volumes of millions from PC or POM, is achieved relatively simply and without much automation – the important research and development stage for the innovative parts has already been completed at this point.

Andreas Lorenz, the company founder's son-in-law, himself multiple World and European Archery Champion and today responsible for product sales in his role as Sales Manager, comments: "My father-in-law has always

favoured slow, well-considered growth. Purchasing and particularly sales never interested him very much and he lived from word-of-mouth recommendations alone. His emphasis has always been on local suppliers in order to pursue his philosophy of long-term relationships of trust and of short supply channels. In 1978, he purchased his first ARBURG machine, with which he produced reliably for the precision engineering and medical technology industries. We try to maintain his credo, influenced by Socrates, of "measure – count – weigh". Why should we change a working cooperation?"

Worldwide reputation: archery accessories from Beiter, such as nocks for arrow ends (top left photo), the Beiter plunger for precise adjustment of the spring force (top right photo) or the arm guard (bottom left photo).



INFOBOX



Name: Werner Beiter GmbH & Co.KG
Founded: 1968 by Werner Beiter
Location: Dauchingen, Germany
Industries: archery, watch industry, medical technology
Products: some 3,500 coded items, Export to 63 countries, directly to specialist retailers and wholesalers, as well as to end customers
Machine fleet: exclusively ALLROUNDER injection moulding machines with clamping forces of 150 and 700 kN
Contact: www.wernerbeiter.com



Photos: MINT

Highlights of the Technology Days 2018: the new machine design and the GESTICA control system (top photo), the Efficiency Arena on the topic of "Digital Transformation" and the numerous applications at the Customer Center (photo on left)

Unique event

Technology Days 2018: Digital transformation and industry trends

For those who want to know what's going on in the world of plastics, a visit to the Technology Days 2018 in Lossburg from 14 to 17 March is a must. Highlights include the Efficiency Arena on the topic of Digital Transformation and the large machines in the new design. A total of more than 50 exhibits featuring innovative applications as well as expert presentations and much more await the guests from around the world.

In 2018, the main focus at the Efficiency Arena will be on Digital Transformation. Eight stations will provide an overview on the comprehensive ARBURG assistance system offerings for starting, setting up, optimising, producing and monitoring tasks through to service. Furthermore, experts will provide information on the GESTICA control system and, at the "Interface Café", on OPC UA, Euromap 77, 79, 82 and other interfaces.

A further highlight will be the large machines: in the wake of the ALLROUNDER 1120 H and 920 H machines, a hybrid ALLROUNDER 820 H machine will be presented size in the new design and with the visionary GESTICA control system.

More than 50 exhibits

On more than 50 exhibits, the guests can experience the entire range of machine, application and process technology, including numerous trends and innovations. Whether lightweight construction processes such as Fibre Direct Compounding (FDC), ProFoam and MuCell, multi-component processing, powder injection moulding, packaging or medical technology, industrial additive manufacturing or Industry 4.0 solutions: there will be something there for everyone.

The Customer Center, Efficiency Arena, Prototyping Center and Evolution offer

numerous insights and information from and about ARBURG. Add to this the broad range of automation solutions through to complex turnkey systems, the service offerings, company tours and expert presentations on Efficiency 4.0, the GESTICA control system, lightweight construction and ARBURG Plastic Freeforming (APF).

For those who are unable to attend "live", the Technology Days News, including an image gallery and the expert presentations will be available for download at www.arburg.com following the event. Additionally, videos of the presentations will be available in the Media Centre on

the ARBURG website and on the "ARBURGofficial" YouTube channel.





Dazzling appearance

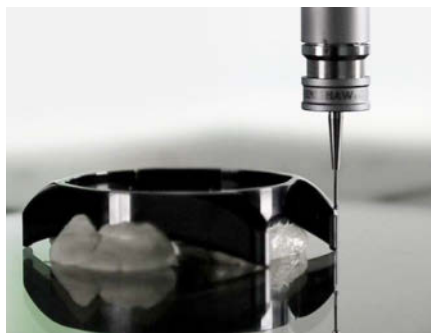
G&F Châtelain: Ceramic injection moulding for watch and jewellery

As a manufacturer of exclusive high-end watches and jewellery accessories, G&F Châtelain SA of Switzerland is famous worldwide. High-gloss polished black and white ceramic components for the watches of various renowned manufacturers are created using the ceramic injection moulding process on ALLROUNDERS.

“Because we initially didn’t have the expertise for the high-volume production of ceramic watches and chain links for bracelets, our contacts with ARBURG were established in 2009,” explains Olivier Bucher, Director of the Ceramics department at G&F Châtelain, regarding the beginnings of a successful cooperation.

Turnkey solution for CIM

ARBURG’s turnkey solutions for the injection moulding of zirconium oxide were able to meet the complex requirements so that the company now operates numerous ALLROUNDER 270 S machines featuring MULTILIFT V robotic systems. These process zirconium oxide in a variety of colours. The initial material, i.e. the plastic/ceramic powder mixture, is compounded



and delivered by an external partner. “One particular challenge was to precisely render a defined shade of white as a colour,” remembers Hartmut Walcher from the ARBURG PIM Team. “We tinkered with this pearl-coloured shade with the material manufacturer in secret for around a year.”

Process with great potential

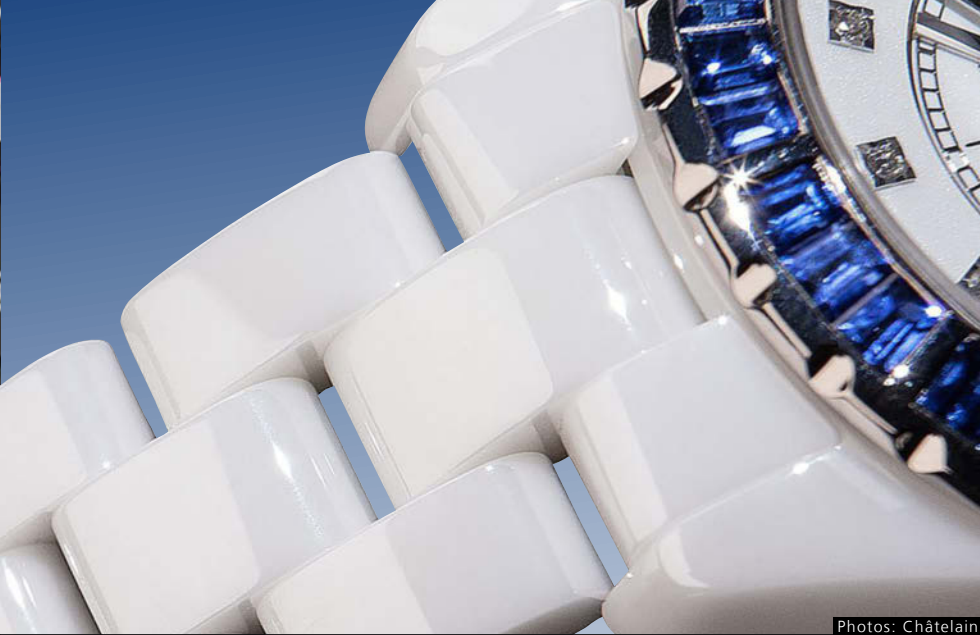
Châtelain produces near-final-contour parts using the CIM process. Olivier Bucher on the potential of the process: “We work with ceramic injection moulding because it enables us to reduce finishing work to an absolute minimum.” What this means is that some milling is performed on the green



compacts, and grinding after sintering. Next, high-gloss polishing is carried out before all the items are finally subjected to a painstaking visual inspection.

Multi-stage process

The injection moulding of zirconium oxide serves to create the required shape, but does not yet provide the desired part properties. Following injection moulding, the robotic system removes the green compacts from the mould and places them in an ordered pattern on a sintering tray. Some parts are finished mechanically. This is followed by debinding to remove the plastic, which acts as the base material, from the parts. The desired hardness is then achieved during the downstream



Photos: Châtelain

ce

llery industry

sintering process. Both processes take place according to a defined time, auxiliary media and temperature. During sintering at approx. 1,400 degrees Celsius for several hours, the ceramic material shrinks in a defined manner by 20 percent, which is already taken into account during the part and mould design stages.

polishing step for the hard ceramic parts in drum systems is highly elaborate, complex and cost-intensive.

New ideas for the future

Thanks to the hardness of zirconium oxide, the products are extremely durable, comfortable to wear and hypo-allergenic. "We're currently considering implementation of further design alternatives with satin or matte surface finishes," says Olivier Bucher. He adds that there is room for more extensive cooperation with ARBURG. Currently, solutions are being sought for the marketing of the companies' joint expertise in high-gloss polished finishes in Asia.

The production of high-quality ceramic parts for watch housings and bracelets (photos above) requires maximum precision (centre left photo). Following injection moulding on ALLROUNDERS (centre right photo), the green compacts are debinded and sintered using thermal processes (centre photo).



Special polishing process

At the end of the debinding and sintering process, the dense and complex ceramic parts can only be worked using diamond tools or water-jet cutting machines. According to Olivier Bucher, the downstream, in-house developed

INFOBOX



Name: G&F Châtelain SA

Founded: 1947 by George and Francis Châtelain

Location: La Chaux-de-Fonds, Switzerland

Employees: approx. 300

Production area: approx. 8,000 square metres in ceramic production

Industries: watch industry

Products: watch components and other metal and ceramic parts

Machine fleet: numerous ALLROUNDER 270 S with MULTILIFT V robotic systems

Contact: www.chatelain.ch

Home game for you!

Technology on Tour: Key topics covered on customer premises

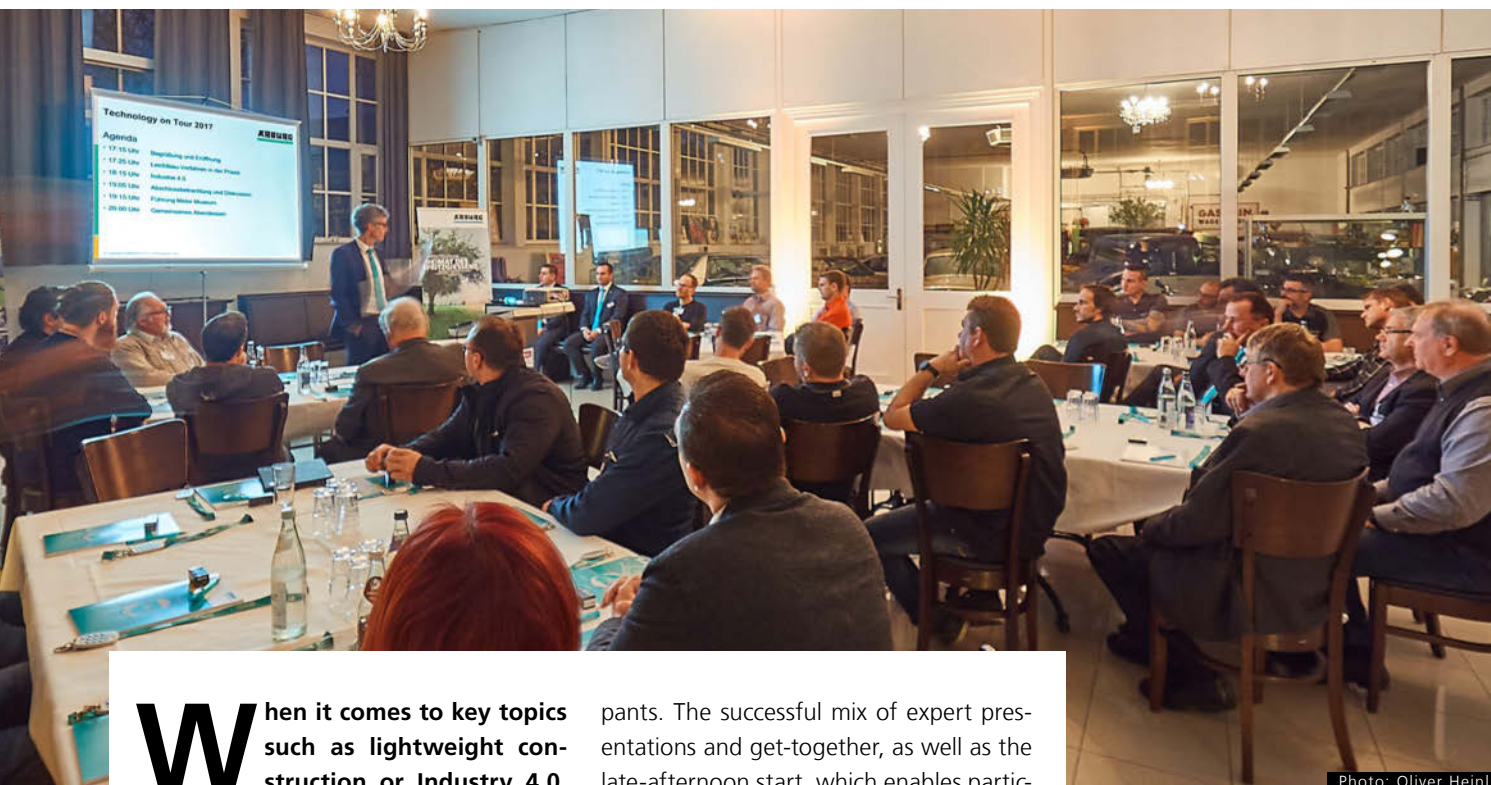


Photo: Oliver Heint

When it comes to key topics such as lightweight construction or Industry 4.0, for ARBURG, this once again means: "Wir sind da." – with the "Technology on Tour" roadshow. This comprises 15 events and is currently touring around Germany.

The tour began in September 2017 in Heilbronn and will come to an end in July 2018 in Munich. "The objective is to inform our customers about trends in plastic processing exclusively and directly at their premises," explains Oliver Giesen, Divisional Manager Sales Germany.

In high demand: lightweight construction and Industry 4.0

Demand is extremely high and the topics of lightweight construction and Industry 4.0 are very popular, which is consistently confirmed through the unanimously positive feedback from partici-

pants. The successful mix of expert presentations and get-together, as well as the late-afternoon start, which enables participation outside working hours, were singled out for praise.

From theory to practice

"The compact presentations offer an initial overview of the key topics, the details can then be covered in greater depth at a later stage," says Oliver Giesen, explaining the principle based on the example of lightweight construction. "During the presentation, the ProFoam, Mucell and Fibre Direct Compounding processes are presented, for example. In the next step, our experts from the lightweight construction team can advise customers individually. After all, eight appropriately equipped ALLROUNDER injection moulding machines are available at our Customer Center in Lossburg for testing all the lightweight construction processes based on specific parts."

Exclusive event: Oliver Giesen, Divisional Manager Sales Germany, welcomed the participants at the "Technology on Tour" in Nuremberg, where the Merks Motor Museum provided an atmospheric backdrop with numerous vintage cars.

The Industry 4.0 presentation covers the digitalisation of production and presents innovative solutions. Possible practical implementations can be seen at the Efficiency Arena at the ARBURG Technology Days, which will take place from 14 to 17 March 2018 in Lossburg (see page 9).



Quality you can feel

formnext 2017: freeformer and functional parts in high demand

The formnext 2017 was extremely successful for ARBURG. More than 21,000 trade visitors came to the leading international trade fair for additive manufacturing in Frankfurt am Main, Germany. The new stand concept and the functional parts manufactured additively with the freeformer garnered a great deal of interest.

The decision to attend the formnext in the context of additive manufacturing and to have participated as an exhibitor from the trade fair premiere three years ago onwards has paid dividends: the heart of additive manufacturing was beating in Frankfurt am Main in November 2017.

Interactive stand

At times, the ARBURG exhibition stand was a real beehive of activity. The stand personnel presented the trade visitors, of which almost half came from abroad, the current capabilities of the freeformer.

The new stand concept had a very positive effect on the number of contacts made. In addition to two freeformers, four interactive stations and two large shelving units showcasing more than 40 functional parts fascinated the visitors.

Broad product range

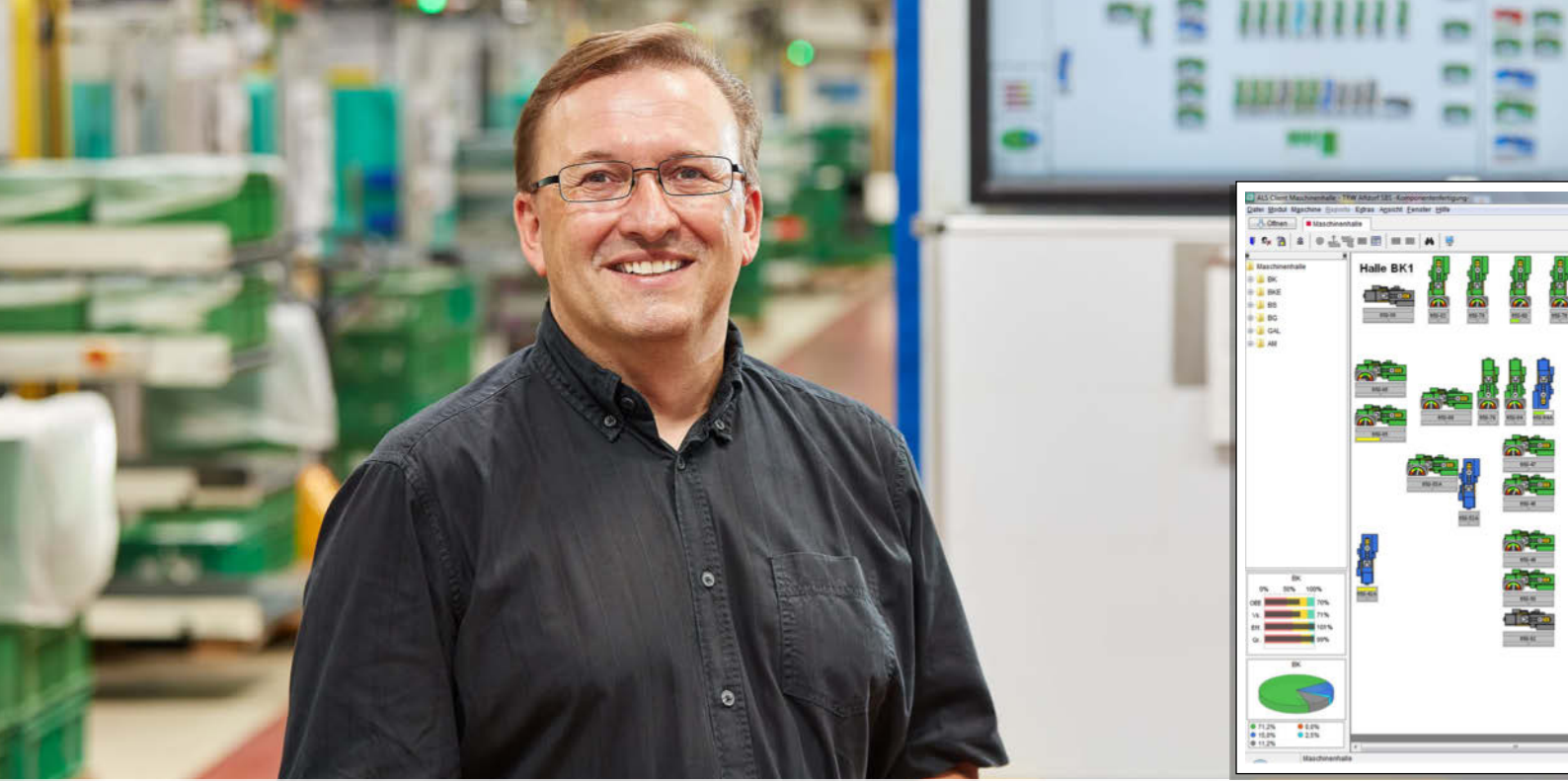
The experts were delighted with the possibility of processing standard PP on the freeformer, which was demonstrated with e.g. functional cable clips, screw caps and cups. On the topic of medical technology, a model hand was on view, the bones of which were made from a standard PP, as well as a finger joint replacement made from medically approved PLLA, as well as a template for knee surgery made from ABS.

Moving planetary roller screw drives which were fully functional without requiring assembly were made from the hard/soft combination TPU and PHA (Arboblend).

At the formnext 2017, Lukas Pawelczyk (left), Manager Additive Manufacturing, and his colleagues from the freeformer Team at the interactive stations on the ARBURG exhibition stand entered into conversations with many trade visitors.

A weighted pulley made from organic PA, a link chain from PP produced using a water-soluble support material without any assembly steps, and luminous USB sticks made from a conductive material (see page 20) were further functional parts manufactured additively with the open freeformer system using ARBURG Plastic Freeforming (APF).





Everything under c

ZF TRW: Flexible production and maintenance thanks to ALS

At its Alfdorf location in Germany, the company ZF TRW, a subsidiary of the ZF Group, develops and produces passenger protection systems for Original Equipment Manufacturers (OEMs) worldwide. With the ARBURG host computer system ALS, the leading global automotive supplier ensures process reliability, transparency and a high level of availability.

ALS networks machines and systems, records and archives process parameters, enables a documented order flow and captures key production values. Furthermore, the host computer plays a key role in preventive maintenance.

Currently, 79 ALLROUNDERS are in operation at ZF TRW, of which around 60 percent are integrated in complex production cells. In Alfdorf, some 450 million moulded parts, 350 million stamped parts and 42 million assembly parts are produced annually. "Our production is highly flexible. To produce more than 200 products, each in up to 20 variants,

we have some 1,400 item numbers and 780 active moulds in operation," explains Holger Albrecht, jointly responsible for process planning at ZF TRW, regarding the complexity of planning, control and documentation of the processes. "We work with up to ten product changes per shift. Minor changes to orders occur virtually every day."

Integrated stamping and assembly shops

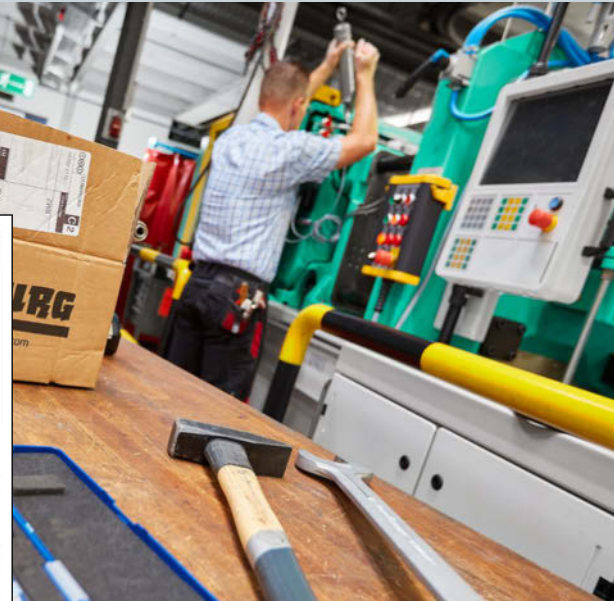
ALS has been in use as a Manufacturing Execution System (MES) since 2001. "We received top consulting and support when it came to implementing and using ALS as a central system in our production facility," says Holger Albrecht describing the good cooperation with ARBURG.

In addition to 79 ALLROUNDERS, six stamping presses, six assembly lines, four electroplating systems, the material supply and control equipment are all linked to the ALS. The complex applications include the fully automatic production of seat belt buckles. For this purpose, metal parts are stamped in an upstream process,

the inserts are overmoulded with plastic and approx. 20 individual parts are fed to a production cell with three rotary tables for assembly. Next, the parts pass through an inspection station and are laser marked with an individual code containing the production and batch data, which can be called up at any time. The belt buckles are then further processed to produce 3-point belts. For safety-relevant parts of this kind, traceability is compulsory. A data logger reads the approx. 4,000 variables from the Siemens control system for the assembly line and provides the relevant error messages to the higher-level ALS. The data is documented for subsequent processing.

ALS for preventive maintenance

"The efficient planning of maintenance orders, including confirmations and documentation of the work performed and the associated assurance of high machine and mould availability would be impossible without the host computer," says Holger Albrecht regarding the important demands placed on the ALS, adding that,



ontrol



Overview in real time

Thanks to the ARBURG host computer system, Holger Albrecht and further ALS users from the Planning, Production Control, Die and Mould Construction, Maintenance as well as staff units and responsible persons for the Plastics, Steel, Assembly production areas keep everything under control from their PCs. They receive an overview of the machine statuses, order progress, malfunctions and process parameters in real time and can conveniently access all the indicators from the production cells in the machine hall.

“Because our machines are in operation practically around the clock during 18 to 21 shifts per week, preventive maintenance in accordance with the maintenance schedule is essential.”

ZF TRW also comprehensively uses further ALS modules, e.g. for the management of machine data sets and mould changes, an overview of resources and active moulds, as well as the creation of reports to key performance indicators such as OEE (Overall Equipment Efficiency), availability and daily reports.

Holger Albrecht, co-responsible for process development in the Plastics division at ZF TRW is confident that ALS ensures high availability in production (photo on left). Set-up and mould maintenance are performed according to a schedule (top right photos).

INFOBOX



- Name:** ZF TRW
- Founded:** since 2015 subsidiary of the ZF Group
- Location:** Alfdorf
- Employees:** 1,650
- Industries:** automotive
- Products:** passenger protection systems
- Machine fleet:** 79 ALLROUNDERS, stamping presses, electroplating systems, inspection cells, assembly lines
- Contact:** www.zf.com

Best connections

LEONI: Flexible turnkey system for four housing versions

LEONI AG from Nuremberg, Germany, operates as an international supplier of wires, optical fibres, cables and cable systems worldwide. Its subsidiary, LEONI Bordnetz-Systeme GmbH, produces four different housing parts with up to 40 inserted screws on a highly automated, flexible turnkey system from ARBURG at its Slovakian plant in Trenčín.

The housings are assembled to form so-called "main fuse boxes", which ensure the power supply in motor vehicles. On the decision to opt for the turnkey system, Günther Hofmann, Operations Manager Injection Molding at the Business Unit Components of LEONI Bordnetz-Systeme GmbH, has the following to say: "Based on the required unit volumes, there were various costing models. Full automation was the most cost-effective for us and for our customers Daimler and BMW. The greatest advantages of this solution are the fast cycle times achieved during insertion. Add to this the effective set-up times."

Flexible automation

During mould changes, only the gripper and the mounting plates for the screws need to be changed. 100 percent of the fed parts are checked for fault characteristics, as are, subsequently, the finished moulded parts. "Further important factors include high process stability and constant cycles," explains Günther Hofmann. This would previously not have been possible in this form in the case of

injection moulding machines with rotary tables and manual insertion.

Project planning, implementation and commissioning of the system was performed entirely by ARBURG. It produces four different housing parts made from glass-fibre-reinforced PA6-GF10 GB20 with one or two screw types per component version. A total of up to 40 metal screws are overmoulded in a cycle time of 40 seconds on a hydraulic ALLROUNDER 820 S

40 inserts as a challenge

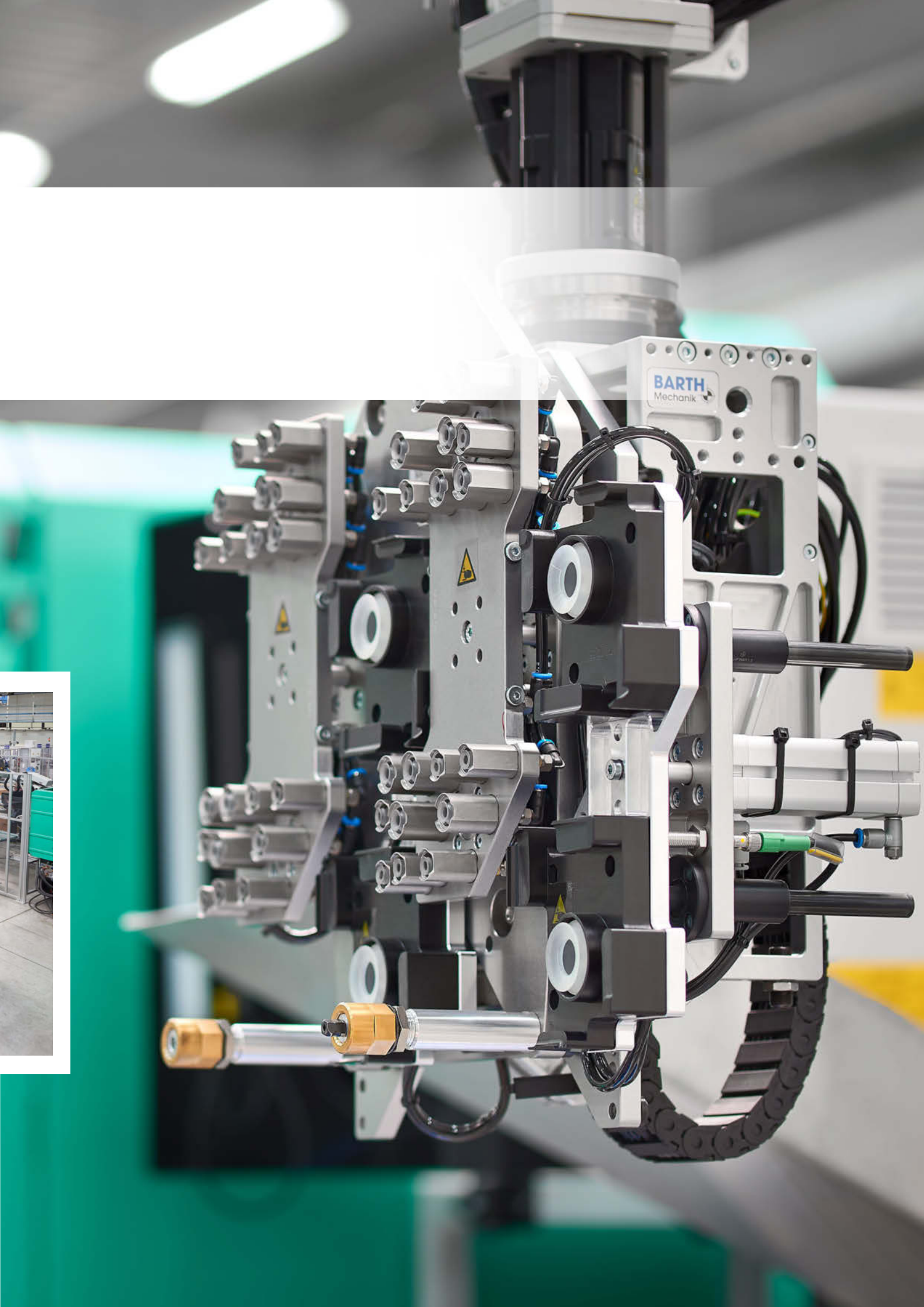
"Automation of the different operations for the various part versions is always a difficult task. In this case, an additional challenge was the processing of up to 40 inserts per cycle," is how Andreas Armbruster from the ARBURG Turnkey department summarises the task at hand.

Sequence coordinated in detail



with a clamping force of 4,000 kN. Five different moulds with between one and four cavities are used. In the mould, magnets are located behind each of the screw positions to hold the screws.

With the turnkey system, four housing versions can be produced (top photo). The two-zone gripper of the robotic system (right photo) inserts the screws into the mould and removes the finished parts.





The screw types are separated from bulk goods and provided via two six-axis robots per cavity with positional accuracy. Regardless of the assembly process, the screws are transferred to the insertion and removal gripper of the vertical MULTILIFT V robotic system. This moves into the opened mould, where it initially removes the finished parts. The gripper is then centred at the mould, where it inserts the screws using the insertion module. The MULTILIFT then transports the four finished parts to in front of the camera system of the inspection station. Here, it is checked that all of the screws are present and that no screw heads have been overmoulded, which is important for correct electrical contacting and for the prescribed tightening torques. All

good parts are set down on a tiered conveyor belt and packaged separately by the operator according to cavity.

Parts detected as "not in order" are removed from the system.

Convincing overall package

Reliability and reproducibility of the system ensure a stable process, which is of vital importance for automated production at LEONI. Here, programming takes place entirely via the SELOGICA control system. The complete range is stored in the ARBURG host computer system (ALS) and automatically loaded with each production order. Günther Hofmann on the general cooperation: "In addition to the reliability of the ALLROUNDERS, the quality of the further system components is also excellent. This high level of quality has become the standard for us. Consequently, further systems are currently being planned with ARBURG."

The housing parts feature up to 40 screws (bottom photo). These are provided to the system's rotary table with positional accuracy by two six-axis robots (top photo).



Photos: LEONI

INFOBOX

Name: LEONI AG, LEONI Bordnetz-Systeme GmbH

Founded: 1917 LEONI, 2007 Business Unit Components, since 2013 injection moulding production of junction boxes and plug connectors

Locations: headquarters in Nuremberg/Kitzingen, Germany; more than 90 production sites in 31 countries in total

Industries: motor vehicle manufacturing, telecommunications, IT, healthcare, energy

Products: cable technology and components for cars & commercial vehicles, industry & healthcare sector, communication & infrastructure, domestic & electrical appliances, wires & strands

Employees: more than 82,000 worldwide

Machine fleet: 41 injection moulding machines in Trenčín, of which 35 ALLROUNDERS

Contact: www.leoni.com



High availability

Smart services: Timely maintenance reduces downtimes

In the Service area on its exhibition stand at the Fakuma 2017, ARBURG demonstrated live how machine availability and efficiency in injection moulding production can be increased through preventive and predictive maintenance. Current examples include the new calibration kit, the condition monitoring of MULTILIFT vacuum generators as well as performance-related lubrication on electric and hybrid ALLROUNDERS.

As a new tool for preventive maintenance, ARBURG has since recently offered its customers worldwide a dedicated calibration kit.

Independent calibration of machines

The kit contains a universal measuring amplifier, two pressure transducers, a position transducer, as well as accessories and software for installation on a PC or notebook.

Customers can use this to independently calibrate the ALLROUNDERS in their injection moulding shop with respect to quality-relevant parameters such as injection and back pressure, as

well as dosage speed and screw position measurement.

With increasing digital networking of machines and components, predictive maintenance is also possible in addition to preventive maintenance. To detect problems in good time before they occur, the capture and analysis of machine data is increasingly gaining in importance. The objective is to keep machine fleet availability high through real-time monitoring of the statuses of process-critical machine components. Condition monitoring of this type enables timely replacement, preventing unforeseen malfunctions and downtimes.

Status monitoring

The specific benefits offered by the real-time-capable ALLROUNDER network system is demonstrated by the new generation of vacuum generators for the MULTILIFT robotic systems. Status monitoring, which permanently records the operating hours, evacuation time, pressure drop and switching frequency is implemented in the vacuum control system. This permits conclusions to be drawn regarding, for example, leaks, soil-

In the Service area at the Fakuma 2017, ARBURG demonstrated the practical benefits of the calibration of ALLROUNDER machines.

ing and suction pad wear. The operator is informed in good time via the SELOGICA control system as soon as a replacement is actually necessary in order to maintain functionality. This avoids costs for unnecessary spare parts and reduces unscheduled machine downtimes.

A further example of predictive maintenance is the performance-related lubrication in accordance with the application and parameter settings of forces, speeds, strokes and times. This reduces lubricant consumption significantly (see page 26).

Illuminating

Fraunhofer ICT: freeformer processes conductive material



Dr. Christof Hübner (right) and Sascha Baumann from the German Fraunhofer ICT in Pfinztal additively manufacture capacitive sensors from electrically conductive CNT composites using the freeformer.

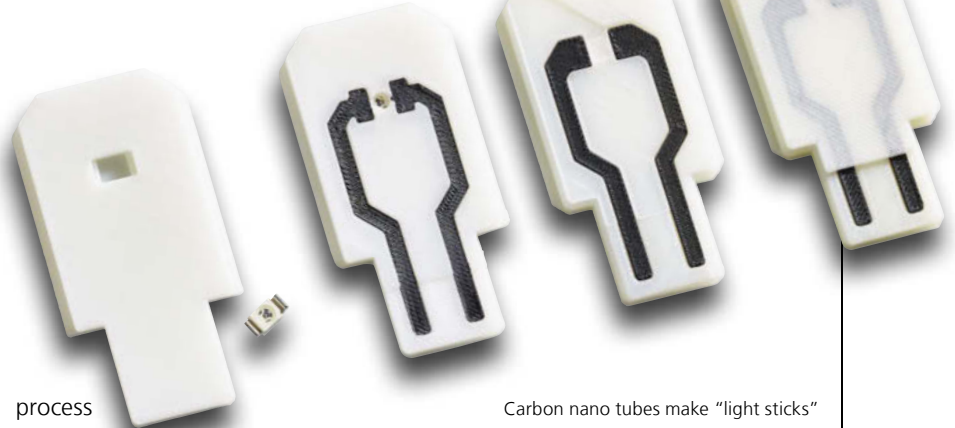
The Fraunhofer ICT in Pfinztal, Germany, has been involved with additive manufacturing since the 1990s. Since 2016, a freeformer has also been in operation there. At the Fakuma 2017, the scientists awed the trade visitors with glowing USB sticks made from functionalised PC/ABS. For this purpose, they had made the plastic conductive with the aid of carbon nano tubes (CNT) and processed the composite using ARBURG Plastic Freeforming (APF).

The core competency of ICT's Polymer Engineering Department is application-based research into technical plastics. "To a large extent, we are concerned with thermoplastics and their processing through extrusion or injection moulding. It therefore made sense to transfer this expertise to extrusion-based additive manufacturing processes in order to open up new application options," says Dr. Christof Hübner, Group Leader Nanocomposites at the Fraunhofer ICT. "In contrast to the closed systems, the freeformer affords us the freedom to process and parametrise the materials we develop in-house ourselves. Moreover, the process step of filament manufacture can be dispensed with."

Sascha Baumann from ICT, who has thoroughly familiarised himself with the freeformer, adds, "In our project-related research work, we principally focus on



Photo: Fraunhofer ICT



functionalised materials, part concepts and process developments." He goes on to explain that he supports colleagues with free-formed components for test setups or functional prototypes, for example.

Plastic causes LED to light up

One innovation that the scientists presented at the Fakuma 2017 were so-called "light sticks", which demonstrate the new applications for functional composites in additive manufacturing. The key here is the functionalised material: nanoscale fillers are compounded into the standard material PC/ABS. In this case, carbon nano tubes (CNT) render the part electrically conductive so that an inserted LED lights up when an electric current is applied. In a further example, the Fraunhofer ICT has also implemented capacitive sensors, which, for example, transmit signals in a contact or proximity-sensitive manner.

For the manufacture of the "light sticks", a base plate made from ABS is placed in the freeformer build chamber and an LED is inserted. The first discharge unit then applies a thin layer of a functionalised material, which anchors the LED mechanically into the part, while also acting as the electrical contact. The second component is an ABS housing. "Particularly in the case of highly filled CNT composites, which are brittle and tend to break, or in the case of very soft materials, the freeformer provides for better processability

and process reliability than filament-based printing systems," explains Sascha Baumann.

Great material freedom

"We have no problems in processing standard geometries and materials. But the material freedom comes at the cost of increasing complexity," says Dr. Christof Hübner, summarising the experiences gathered to date. One challenge that he mentions is, for example, differently parametrised areas within a part, e.g. in order to implement zones with differing degrees of filling or densities. "If we encounter very complex issues, we resort to ARBURG's expertise. This always goes very smoothly and swiftly," says Dr. Christof Hübner.

Carbon nano tubes make "light sticks" light up (top left photo). The Fraunhofer ICT compounds the electrically conductive material in-house and then processes it using the APF process on the freeformer. First, the black functionalised material is additively applied onto a base plate with an inserted LED, followed by the white housing made from ABS (top photo).

INFOBOX



Name: Fraunhofer-Institut für Chemische Technologie (ICT)
Founded: 1959 as one of the first Fraunhofer institutes
Location: Pfinztal, Germany
Divisions: Compounding and Extrusion, Nanocomposites, Foam technologies, Thermoplastics, Thermosets, Fibre Composites, Microwave and Plasma Technology, as well as Plastics Testing.
Employees: 550, of which 110 in the Polymer Engineering department
Industries: energy and environment, defence, security, aerospace, chemical and process engineering, automotive and transportation
Contact: www.ict.fraunhofer.de



Library for best

KIMW project: Best cavity surface for varying

What is the best cavity surface for the relevant moulded part requirements?

A project was set up at the KIMW plastics institute in Lüdenscheid, Germany to answer this question, which is vital for the surface finish of moulded parts. The influence of the demoulding force, which depends on the mould surfaces, coatings and materials, is the subject of the investigation. ARBURG machines and robotic system technology are used for this purpose.

“With this project, which has been running for three years, we want to provide reliable measured values and solve the demoulding issues,” explains Frank Mumme, Department Manager Coating Technology at KIMW. For this purpose, the influence of texture, material and coating of mould surfaces on the adhesion and sliding forces of the plastic parts produced are investigated.

Mould insert and plastic pairing

At the end of the investigation – either using an existing customer mould, or a special test-specimen mould – a characterisation of the mould insert/plastic material pairing is performed. Important here are the reproducible conditions which can be achieved by means of the testing process. In this manner, a long-term data collection can be built up and new pairings can be easily compared with existing results.

surface finishes

moulded part requirements



KIMW samples demonstrate different surface finishes (photo on left). During presentation of the project, test specimens were produced on an ALLROUNDER (centre photo) and removed by a MULTILIFT robotic system (photo on right).

Good results thanks to stable cycles

The project was presented on a demonstration system at the Technology Days 2017. The mould, which featured the relevant measuring equipment, was used on a hydraulic ALLROUNDER 320 C GOLDEN EDITION with a clamping force of 500 kN and a MULTILIFT SELECT robotic system removed the parts. "This combination of technology was interesting because it enabled such even cycles, which make the measured values even more meaningful," said Frank Mumme. Test specimens weighing three grams were produced

from PC in a cycle time of 45 seconds. A standard 15-millimetre 3-zone screw was used for injection.

Various mould inserts

KIMW has invested a great deal of time in the development of a test specimen geometry and the relevant master mould with various mould inserts. The special feature of this single-cavity mould is that the various inserts can be rotated slightly in a reproducible manner via a hydraulic drive. In this manner, the important parameters of torque, holding torque and break-away force can be determined to specify the optimal combination of material and mould surface. This means that both raw material producers as well as injection moulding companies can test their materials in order to implement optimisation measures during mould design or adapt the materials with regard to mixtures and additives.

Optimising quality and process

The demoulding force measurement and the resulting alternatives for material and cavity surfaces serve for optimisation of the injection moulding process and moulded part quality. Sampling is performed with a number of surfaces and several alternative materials. Through the continuous work, an adhesion index for different materials and surfaces is to be created – a kind of "library", which will provide all material manufacturers and processors with the optimal combination of plastics and cavity surfaces in order to achieve cost-effective part production.

The participants in the workshops focussed on the question of "Where could ALS developments lead in the future?"

Experts together

User meeting: exchange of experiences with ALS

Some 100 users of the ARBURG host computer system (ALS) met in November 2017 in Lossburg for an intensive exchange of experiences as well as practice-based presentations by customers and partners. The ARBURG experts also presented new ALS functions and conducted workshops on potential development topics.

The ALS development team initially presented guests with innovations such as the "Mobile Maintenance" module and "ALS Mobile" in a responsive design. Moreover, there were tips, for example on control boards and further useful functions for detailed production planning as well as an outlook on the activities for the further development of ALS.

New impetus

This was very well received by the users: "The future is mobile ALS. I was able to learn a great deal from the support team and other participants on this topic," says Michael Paule, praising the value of the event. This ALS user works in the injection moulding facility of Robert Bosch GmbH in Waiblingen, where some 230 machines,

including assembly I/Os (input/output signals), as well as the plant in Thailand, including the planning of maintenance and service, are linked to the ALS.

A further topical subject for many is energy data acquisition and management, on which Knud Clauson from Econ Solutions GmbH gave a presentation. He presented the "econ sens3" multifunction measurement device and explained how the acquired energy consumption values can be integrated into order and item-related ALS reports.

Konzelmann success story

The success story "ALS introduction from 0 to live" from Konzelmann GmbH – presented in a practice-oriented manner by Frank Schömer and Eda Yayla was also received with great interest. They discussed the requirements that needed to be met before "going live", how they connected the ALS to the existing ERP system and the added value that the host computer now brings, including mould management and the maintenance of peripheral equipment. Holger Albrecht, jointly responsible for the process planning for plastic parts at ZF TRW has

already been working successfully with ALS since 2001 (see page 14). For him, the user meeting is definitely worthwhile: "Here, I can network highly effectively and learn a great deal."

Workshops on development requirements

Workshops on the topics of "Digital shift book" and "Smart user interface" rounded off the user day. The results were presented by the ALS support team. "ARBURG surprises me again and again. I think it's really great that the ALS team listens to its customers and then responds accordingly," is the positive assessment made by Jens Herfurth, who is responsible for work preparation at Ensinger GmbH in Rottenburg-Ergenzingen, Germany.

"Our host computer customers and ourselves have used the ALS user meeting for intensive conversations, discussions and the exchange of experiences," summarises Axel Kinting, Group Leader Control Technology, with regard to the successful event.

25 successful years

Silver anniversary: ARBURG Poland celebrates 25 years of operations

In 2017, four silver anniversaries were on the schedule for ARBURG. Following the events in Belgium, China and Malaysia, “25 years of ARBURG Poland” was celebrated in style on 26 September 2017: with some 200 guests and a high-ranking delegation from headquarters.

In the unique setting of the Old Orangery in Warsaw, Managing Partner Michael Hehl presented the traditional anniversary sculpture to Managing Director Dr. Sławomir Śniady and reminisced on the special success story of the subsidiary.

Rapid development in Poland

“When we established our subsidiary in Poland in 1992, we started virtually from scratch: the name ARBURG and the ALLROUNDER injection moulding machines were not very well known in Poland,” remembered Michael Hehl. After initially selling used machines, the first new machines soon followed. Things then progressed rapidly from there. “Our level of recognition grew, the subsidiary developed exceptionally well and we continuously gained market share,” summarised the Managing Partner.

ARBURG technology in demand

Of the numerous small and medium sized family enterprises in Poland, many are now steadily growing suppliers for the automotive, electrical, packaging and household appliance industries. “The areas of pharmaceutical and medical technology as well as the automation and turn-key sector have also developed extremely



Photo: Remigiusz Gałazka

well for us,” explained Managing Director Sales, Gerhard Böhm.

Expertise and continuity

“In addition to the high performance of our machines, our customers value the excellent on-site support, which is characterised by expertise and continuity,” said Gerhard Böhm and, in this context, referred to the construction of the ARBURG Technology Center in Warsaw as an important milestone. At the anniversary event, customers repeatedly emphasised that, in ARBURG Poland, they have a stable, reliable and competent partner that helps them to operate efficiently and successfully.

Further anniversaries in 2018

The anniversaries will once again be coming thick and fast this year: the subsid-

Proudly looking back on 25 successful years in Poland (from left): Michael Hehl, Managing Partner, Dr. Sławomir Śniady, Managing Director ARBURG Poland, Gerhard Böhm, Managing Director Sales, Marek Zembrzusi, Deputy Managing Director ARBURG Poland, and Stephan Doehler, European Sales Director.

aries in the UK, Italy and the Netherlands are celebrating 25 years, and Mexico 10 years since their establishment.



TECH TALK

Oliver Schäfer, Technical Information



Targeted lubrication

Predictive maintenance reduces costs and increases availability

Higher machine availability with fewer unscheduled downtimes while also reducing maintenance costs and greater reliability during production planning: Predictive maintenance offers numerous advantages. The basis for these are smart data analyses that enable a situation or Performance-related response by the machine control system. This is demonstrated by the example of the lubrication of electric and hybrid ALLROUNDERS.

The electric toggle-type clamping units were optimised for predictive maintenance. Here, in addition to the toggles and planetary roller screw drives, all the guides for the moving mould mounting platen, drive platen and ejector are integrated into the central automatic oil lubrication system.

An electric pump unit supplies several lubrication channels, which are controlled via switching valves, pressure switches and dosing elements. Dosage of the oil itself is performed locally via individual dosage elements in close proximity to the lubrication points.

Monitoring of lubrication lines

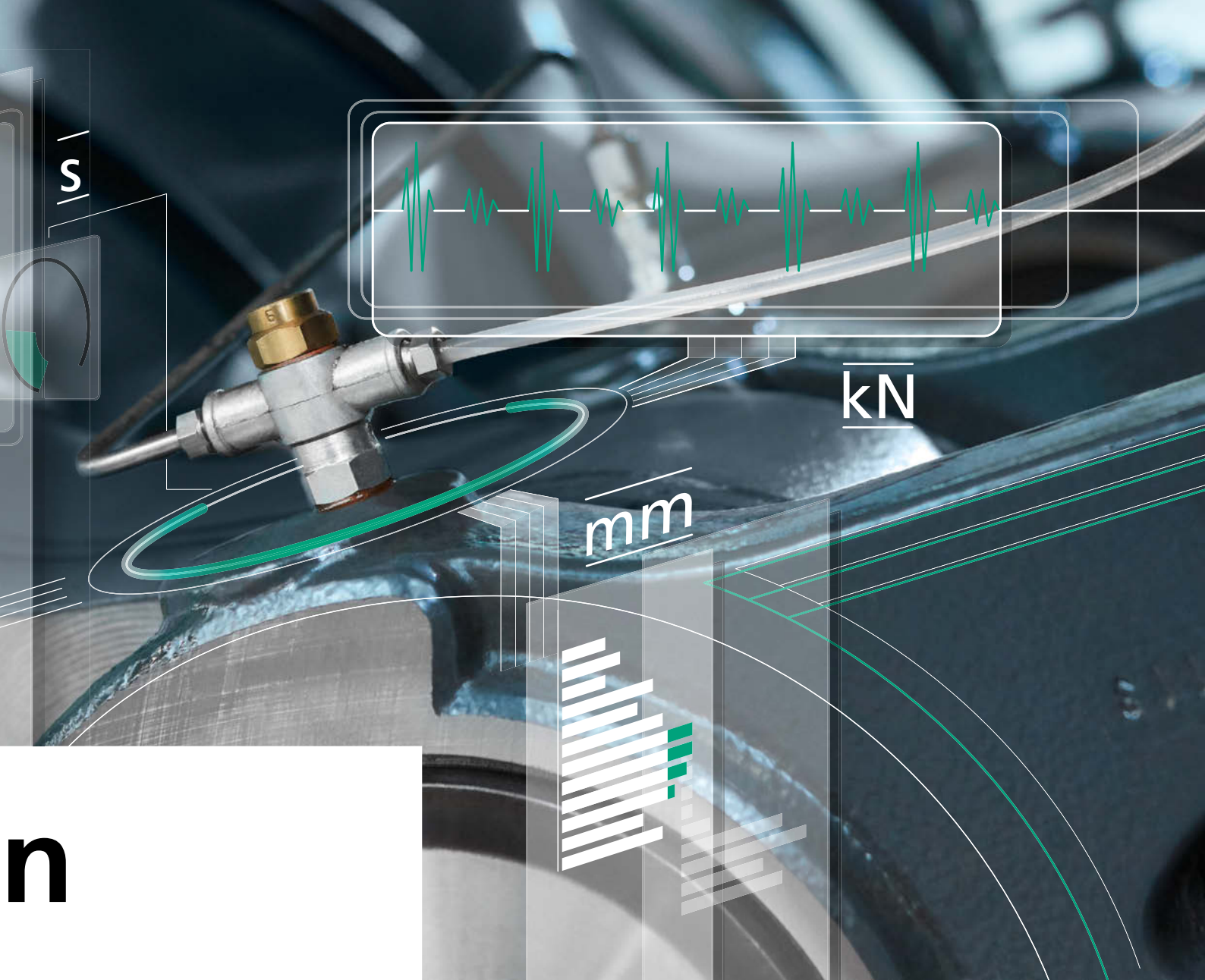
This more technically complex design has the advantage that the pressure in the lubrication lines right through to the dosage element at the lubrication point can be monitored. Broken or kinked lines are reliably detected by the pressure switch and the machine is stopped in time before inadequate lubrication takes place. Add to this recirculation and separation of the used oil, which simplifies disposal.

Through the integration of addition-

al connection circuits in the automatic central oil lubrication system, numerous manual lubrication points have been dispensed with on the toggle-type clamping units. To further simplify preventive maintenance, in addition to the oil lubrication points, all the grease lubrication points also converge via steel lines to one central and easy-to-access lubrication point outside the machine panelling.

Lubrication during production

As a result, dismantling work can be dispensed with. All of these measures significantly reduce the time and costs of maintenance, while also providing greater process reliability. Because lubrication can take place during running operation without interrupting production, machine availability also increases. Integration



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of central oil and grease lubrication – already standard on electric and hybrid ALLROUNDERS from size 630 upwards as well as on the GOLDEN ELECTRIC machineseries—is also an important step for further optimisation, which the ARBURG engineers are currently developing: Performance-related lubrication.

Process-dependent lubrication

Instead of defining lubrication intervals based only on the number of cycles, these will in future be individually calculated for each application depending on the parameter settings such as forces, speeds, strokes and times. Extensive tests are currently underway during which new machines are compared with “run-in” machines. Initial results reveal the potential of smart data analyses in this area:

Depending on the machine size and application, lubricant consumption can be reduced by up to 30 percent.

The improvements for predictive maintenance of the ALLROUNDER toggle-type clamping units clearly demonstrate how digitalisation can progressively reduce the cost of operating injection moulding machines. Simultaneously, productivity and adherence to deadlines are increased. In the final analysis, these are decisive factors when it comes to competitiveness and cost reductions today.

Performance-related lubrication: based on smart data analyses, the lubrication intervals will be individually calculated in the future depending on forces, speeds, strokes and times.

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ONE GUARANTEE OF QUALITY
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ONE CONTACT
ONE PROJECT
ONE CONCEPT
ONE SOLUTION



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