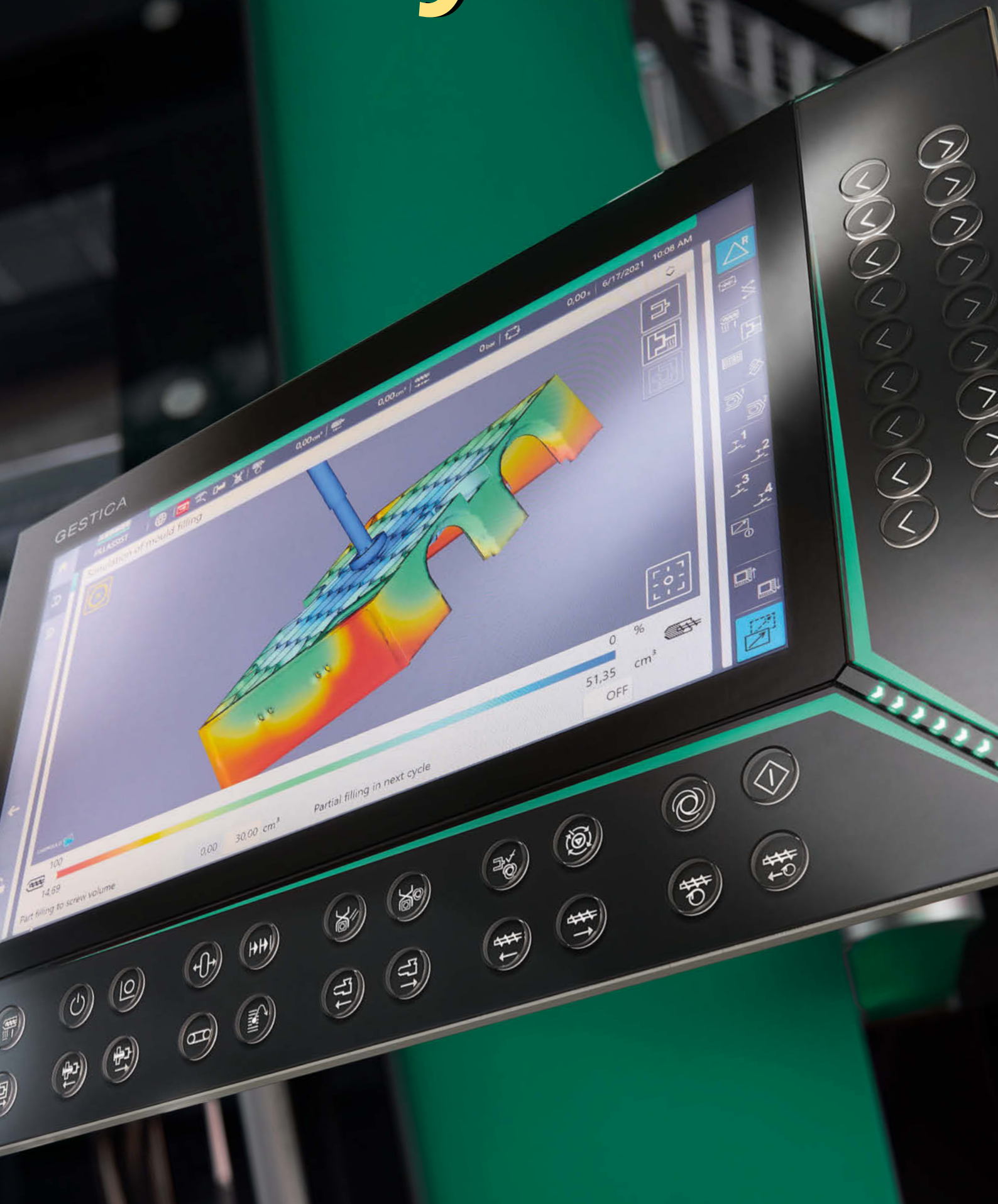


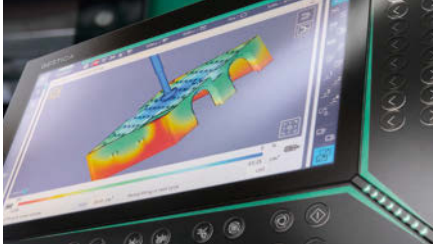
# today

The ARBURG Magazine

Issue 77

2021





**4 GESTICA:** Control system sets global standard

**6 elobau:** Turnkey system for nano push button switches excels through energy efficiency and flexibility

**9 ALLDRIVE:** Greater dynamics, more options



**10 Fakuma 2021:** Digitalisation and sustainability for more production efficiency

**12 ScrewPilot:** Unique feature for reproducible mould cavity filling



**13 arburgXworld:** 2,000 mark passed in early summer

**14 TB&C Mexiko:** Automated ALLROUNDER 1120 H produces automotive components



**16 ALLROUNDER MORE:** More space, modularity and convenience in multi-component injection moulding

**18 Bioplastics:** Almost 40 years of "green" ARBURG know-how



**20 ABL:** Electronic pioneer relies on ALLROUNDER

**22 Neue Materialien Bayreuth:** EU joint project can only be implemented with freeformer



**24 Turnkey:** Refining and separating cups by type

**26 Tech Talk:** Melt compression: Important parameter for the injection moulding process

## LEGAL NOTICE

today, The ARBURG Magazine, Issue 77/2021

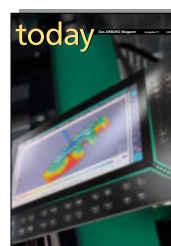
Reprints – including excerpts – only with express permission

**Responsible:** Dr. Christoph Schumacher

**Editorial advisory board:** Christian Homp, Martin Hoyer, Rainer Kassner, Lukas Pawelczyk, Jürgen Peters, Andreas Reich, Birgit Roscher, Bernd Schmid, Wolfgang Umbrecht, Dr. Thomas Walther, Manuel Wöhrle

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

**Editorial address:** ARBURG GmbH + Co KG, Postfach 1109, 72286 Lossburg, Germany  
**Contact:** +49 (0) 7446 33-3149, today\_kundenmagazin@arburg.com, www.arburg.com



The "Made by ARBURG" control system means: The GESTICA hardware and software is based on decades of development experience. Among the numerous assistance functions of GESTICA is the "aXw Control FillAssist" for process simulation directly on the machine.

**ARBURG**



## Dear Readers,

“Wir sind da.” – with another edition of “today” and innovative products we’ll introduce you to in this issue. One new product, for example, is the ALLROUNDER MORE series, which we have designed precisely to meet the high-end requirements of multi-component injection moulding.

As regards our existing portfolio, we always adhere to Henry Ford’s principle: “Everything can always be done better than it is being done.” The best example of this is our control systems. Trying to go one better than SELOGICA, which has been a success for decades, was an extraordinary challenge. But with GESTICA, we’ve managed to do it! It has since overtaken the SELOGICA and has been showcasing its performance to impressive effect, including in the TB&C turnkey system in Mexico. Another success story is the research project for the

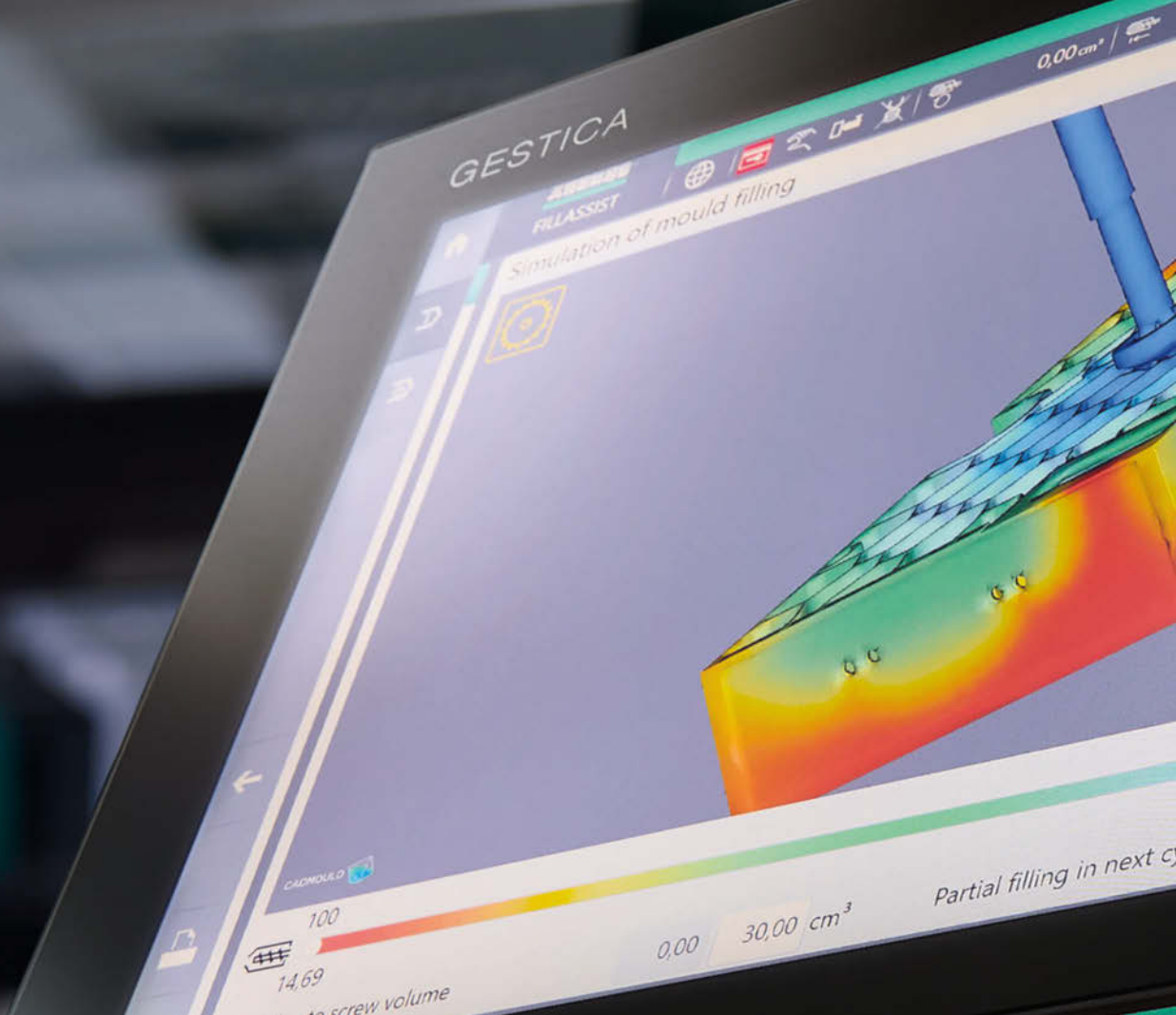
production of bioreactors, where the freeformer was the only additive manufacturing system considered.

We’ve also looked towards the future with our successful ALLDRIVE series: These electric high-performance machines can now be configured even more specifically in terms of performance.

The base for all new and further developments: Our headquarters in Lossburg. Here we have everything under one roof – from development to production to service – allowing us to efficiently “bring ideas to life”. One area where there’s a lot going on in this regard is “arburgGREENworld”, which deals with issues of sustainability and the conservation of resources. You can find out more about this in this issue of “today”.

Happy reading!

Juliane Hehl  
Managing Partner



# New benchmark!

## GESTICA: Control system sets global standard

**Why does Arburg develop and build its own control systems? The answer is simple: Because they play a key role in the efficient production of quality products. Even more of a challenge: Building on the success story of SELOGICA and making GESTICA even better.**

ARBURG embarked on this path at an early stage. A visionary milestone was the world premiere of GESTICA as the “control system of the future” at the world’s leading trade fair K 2016 in Düsseldorf, Germany.

“First of all, our focus was on finding a reliable base, in other words, the hardware”,

says Guido Frohnhaus, ARBURG Managing Director Technology & Engineering, of the first phase. “Key aspects were operational safety and operator ergonomics in an industrial environment.”

### GESTICA is safe and fun to use

Technical hardware features include two separate controllers for operation and process control, multi-core technology for simultaneous execution of multiple tasks, a closed-loop operating system that doesn’t require security updates, a large, high-contrast full HD monitor, and the EASYslider for “blind” operation of movements during

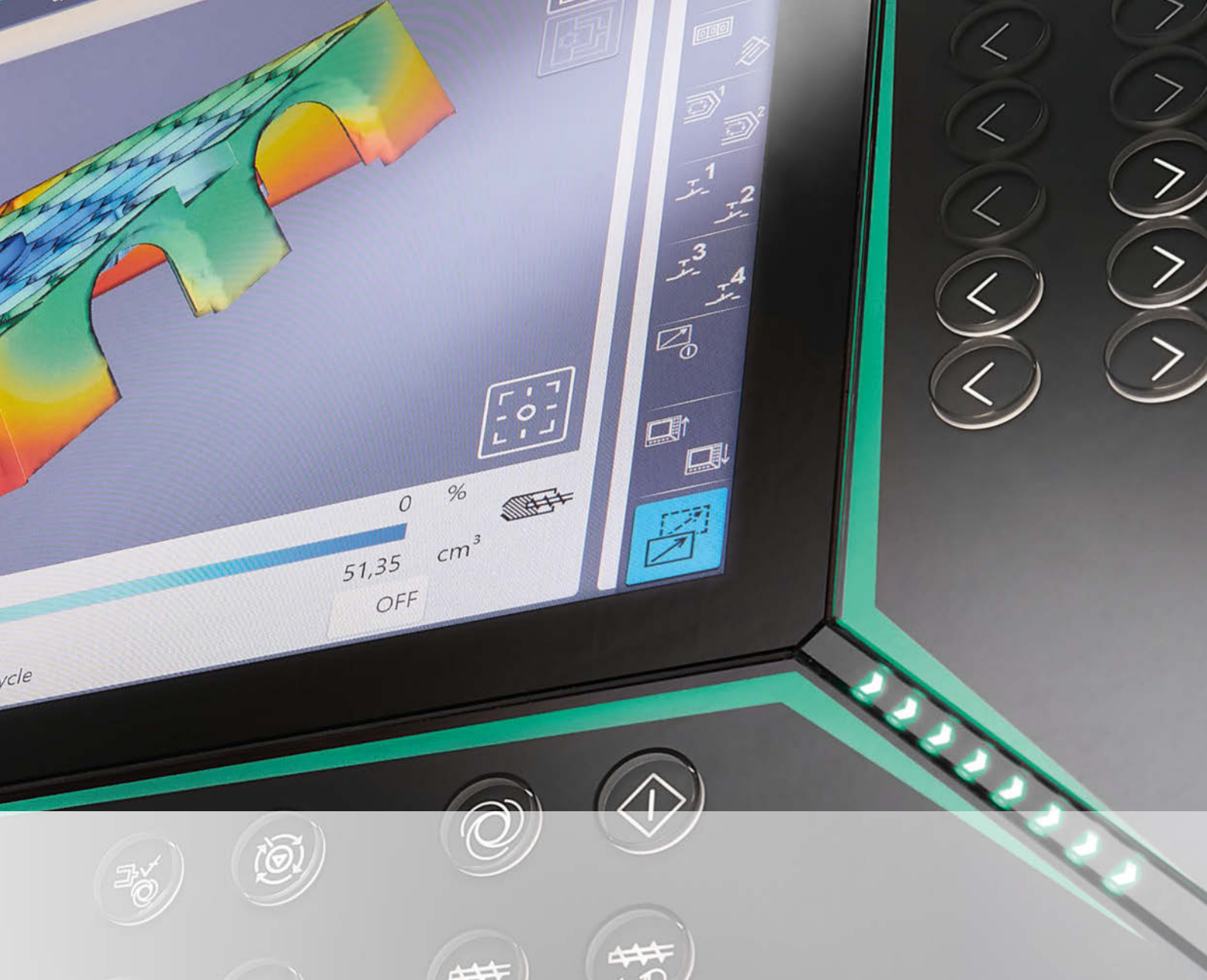
set-up. But working with the GESTICA is not just easy and safe, it’s also fun: The operating unit has the premium look and feel of modern mobile devices for which it justifiably received the reddot award.

“We know that what matters most to our customers are the ‘inner values’. So the software and user interface should offer the best possible support”, says Guido Frohnhaus of another point of the development strategy.

“For example, it was important to us that the SELOGICA and GESTICA data sets were fully compatible with each other”. That may sound simple at first, but it’s anything but.



Explainer video  
GESTICA



### Ever-expanding range of functions

The bar was set accordingly high, as ARBURG has traditionally gone its own way – with a central control platform that also fully integrates robot systems. In addition, features developed individually at the customer's request are also incorporated into the standard and updated. This results in an enormous range of functions that have been successively transferred to the world of GESTICA with its intuitive gesture control. The navigation and sequence editor in particular have been optimised in detail, so the machine operator saves time and reaches the goal with just a few clicks. "Today, the GESTICA range of functions is already wider than that of

SELOGICA" Guido Frohnhaus says of the current status. One innovative feature, for example, is the "aXw Control FillAssist", which enables process simulations directly on the machine.

### The rise of assistants

The focus of further developments is on additional smart assistants and adaptive regulation concepts to create unique added value. ARBURG will be presenting two additional milestones on the way to becoming the new benchmark in controller technology at Fakuma 2021: The "aXw Control CycleAssist" makes optimisation potential in the process sequence transparent in a targeted manner, while the "aXw

Innovative feature of GESTICA:  
The "aXw Control FillAssist" enables process simulations to be run directly on the machine.

"Control EnergyAssist" saves energy when activating and deactivating the injection moulding machine.

# At the push button

## elobau: Turnkey system for nano push button switches excels through energy efficiency and flexibility

**e**lobau has relied on technology and know-how from Lossburg for more than 35 years. The collaboration on the turnkey system for the production of contactless nanosensors came about not least because ARBURG was able to offer an energy-efficient, highly flexible solution with an electric ALLROUNDER.

elobau GmbH & Co. KG from Leutkirch in Allgäu, Germany, manufactures sustainable operating elements for construction and agricultural machinery and indus-

trial trucks, as well as contactless sensor technology and level measurement for mechanical and plant engineering. For all of these, the company either develops customised solutions or uses a product from the comprehensive standard programme.

### Inserting the smallest of magnets

A turnkey system was required when elobau wanted to expand and automate the production of nanosensors in February 2018 to accommodate an additional new magnet variant. Manual mould-entry oper-

ations were to be avoided as far as possible because of the very small and delicate parts and the production of two variants on one machine. The magnets, which must be inserted into the tool with the poles reversed, are extremely small, at 1.5 x 2.0 x 3.0 millimetres, which was another point in favour of the automation of production. And according to Dominik Schubert, head of injection moulding at elobau, the quantities of up to 500,000 parts per year can also be supported.

The nano push button switches are space-saving, safe and can be used any-





where. They are used worldwide in joysticks, handles, armrests or the housings of “off-highway vehicles” such as industrial trucks or construction and agricultural machinery, as well as in industrial applications.

### Integrated process steps

The turnkey system based around an electric ALLROUNDER 370 A with MULTILIFT V robotic system for part handling is capable of picking up the singulated magnets of both variants and inserting them with the correct polarity, thanks to the integrated magnet singulation for the two production alternatives and the individual gripper physiognomy. The two-cavity mould comes from the company’s own mould construction in Probstzella, Thuringia, Germany. Hall sensors are used to control the exact position of the inser-

tion. The sensor interrogates a closed magnetic field. If the circuit does not close, an error is reported and the injection moulding process is stopped. This check ensures that the magnets are inserted in the correct position and orientation in the mould. Following the check, the overmoulding with a PC is carried out via a cold runner system and the two parts and the sprue are removed from the mould. The sprue is discharged by the robotic system and the finished parts are deposited on a conveyor belt. The complete cycle takes about 26.5 seconds.

### Two variants – one system

The system achieves a high degree of autonomy as a result of the movable magazines for both magnet variants. The vertical and the horizontal loading plate are filled



The sophisticated nanosensor with a magnet in the centre and a diameter of around 12.5 millimetres (images above) is produced on a turnkey system that is manually loaded with magnetic magazines (left image).



In the turnkey system (image left), the gripper in the mould first inserts the magnets and then removes the moulded parts and the sprue (image above).

by the operators at a transfer station and work with 30 horizontal or vertical magnetic magazines each. Two lockable transfer stations can each provide two magnets per variant, which are then taken over by the gripper of the MULTILIFT V. The challenge was to make the magnets available lying both horizontally and upright, as the correct pole position is the most important factor during overmoulding. In variant one, the polarity is on the small front end; in variant two, it is on the long side.

### Fully integrated into the control system

According to Dominik Schubert, it was also important for elobau "that the robotic system and singling could be fully integrated into the machine control system. We also received a central 'system controller' from system supplier ARBURG, which makes the overall process much easier to manage."

### Impressive overall package

The competent and transparent advice, fast, quality service, particularly in respect of the supply of spare parts, as well as the reliability of the ALLROUNDERS were the deciding factors in elobau deciding to

work with ARBURG on this demanding application. Another consideration was the output, precision and the low energy consumption of the system. This is something the company attaches great importance to, as its production has been climate-neutral since 2010. High-end technology for high-end components – that's why elobau and ARBURG work together.

## INFOBOX

**Name:** elobau GmbH & Co. KG  
**Founded:** 1972 by Fritz Hetzer  
**Locations:** Injection moulding workshop in Leutkirch in Allgäu and mould construction in Probstzella, Germany  
**Turnover:** €108 million (2020)  
**Employees:** More than 1,000  
**Products:** Operating systems and products for level measurement, sensor systems and machine safety  
**Machine fleet:** 20 injection moulding machines, of which six are ALLROUNDERS  
**Contact:** [www.elobau.com](http://www.elobau.com)



# Strong performance!

## ALLDRIVE: Greater dynamics, more options

**T**he electric ALLROUNDER ALLDRIVE is predestined to produce challenging parts. It is precise, energy-efficient, and fast. While some applications require short dry cycle times and high clamping unit performance, for components with filigree areas, the injection power is what counts. It is exactly here where ARBURG comes in, with a significantly expanded offer range.

“We now offer even greater dynamics and more options for our ALLDRIVE series,” explains Werner Faulhaber, Development Area Manager at ARBURG. The starting point is the “Comfort” performance variant, which can manufacture technical products with high precision. The

“Ultimate” variant has around 35 percent faster dry cycle times and is predestined for the high-end area, for fast running applications, or to optimally fill components with thin-walled structures.

### For even more applications

The injection speeds were increased for the ALLDRIVE series, so a wider application range is now covered. Customers who need even more dynamics can increase the injection speeds by a further 30 percent with both the “Comfort +” and “Ultimate +” variants. The most powerful machine, the “Ultimate +” reaches injection speeds of up to 400 millimeters per second.

“With these four variants, we can customize the machines more precisely to

customer requirements, and configure an ALLROUNDER ALLDRIVE that provides optimal performance at an attractive price,” concludes Werner Faulhaber.

### ALLROUNDER ALLDRIVE:

The four variants provide optimal performance at an attractive price for every requirement.





# The best of both w

## Fakuma 2021: Digitalisation and sustainability for more produc

**F**inally – in October it’s that time again: ARBURG will be at Fakuma. The “best of both worlds” is the focus of the trade fair presentation in Friedrichshafen, Germany. At the ARBURG stand this year, everything will be about digital, sustainable and production-efficient plastics processing. And the best part: Trade visitors can again experience the exhibits “live and in colour”, talk to the experts and take valuable insights home with them.

“Fakuma has traditionally been of great importance to us”, emphasises Juliane Hehl, who as managing partner is responsible for marketing at ARBURG, in advance of the trade fair. With nine machine exhibits and numerous digital products and services, ARBURG, as an industry pioneer, will give a practical demonstration of how plastic parts can be produced today and tomorrow, competitively, sustainably, and digitally interconnected.

At Fakuma 2021, the focus will be on the future topics of digitalisation

and sustainability with “arburgXworld” and “arburgGREENworld”. In this way, ARBURG will bring together “the best of both worlds”. Other areas of focus are the topics of planetary roller screw drives and the GESTICA control system (see page 4). Both products are “Made by ARBURG” – in other words, developed and produced in Lossburg.

---

### arburgXworld

---

The same also applies to the “arburgXworld” customer portal, to which ARBURG is constantly adding further digital services and features that bring genuine added value – such as the “AnalyticsCenter” app for process analysis. Another innovation: In the future it will also be possible to integrate machines and peripheral devices from other manufacturers into the central platform.

---

### arburgGREENworld

---

The sustainable production of plastic parts and their return into the recyclable

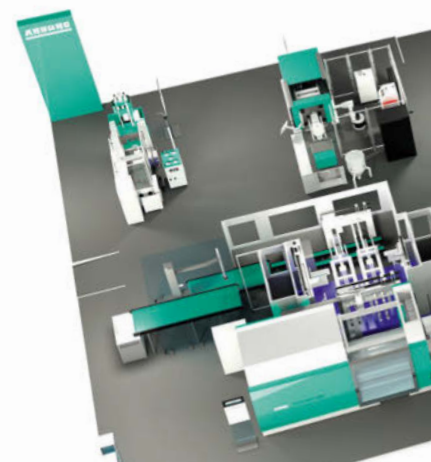
materials cycle (circular economy) is illustrated through innovative application examples. These will include separation by type using a digital watermark – “HolyGrail2.0” and “CurveCode” – during production of IML and espresso cups. Another eye-catcher are “green” sunglasses made of bio-based PA12 and produced on a sophisticated turnkey system.

---

### World premiere: ALLROUNDER MORE

---

The ALLROUNDER MORE series for efficient multi-component injection moulding (see page 16) will celebrate its world premiere at an external trade fair. Also





“Wir sind da.” – is once again the motto at Fakuma 2021, where experts such as Manuel Witte (2nd from right), head of the Applications & Industries department, will personally present the exhibits to visitors.

# orlds

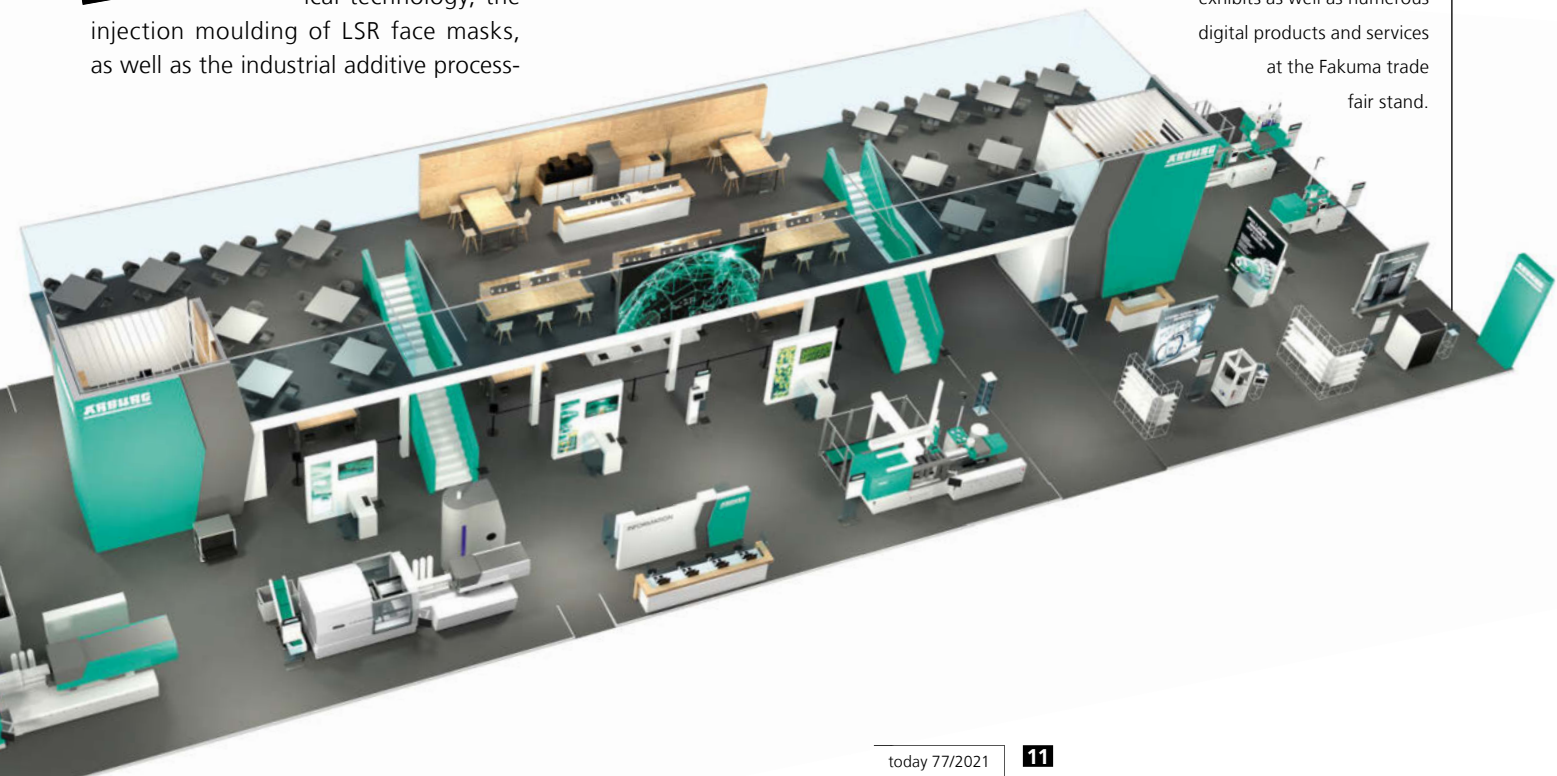
## tion efficiency



on view will be the production-efficient manufacture of IML cups for packaging technology, blood tubes and 2k fluid housings for medical technology, the injection moulding of LSR face masks, as well as the industrial additive process-

ing of original plastic granules with the freeformer and of LSR materials with a 3D printer from innovatiQ, a company in the ARBURG family.

Major presence: ARBURG will be showcasing nine machine exhibits as well as numerous digital products and services at the Fakuma trade fair stand.



# Filled to the brim

## ScrewPilot: Unique feature for reproducible mould cavity filling

**A**RBURG offers numerous clever solutions that can benefit everyone. One of these “know-how champions” is the “aXw Control ScrewPilot” or the “position-regulated screw”, as this unique feature for perfect moulded part quality is technically known.

The function and special features of the “ScrewPilot” can be clearly explained using the example of driving assistants for passenger vehicles. If the speed changes due to external influences such as headwinds or downhill gradients, the cruise control throttles or accelerates. This is also how the familiar control measures work during injection, when the speed of the plasticising screw changes due to interferences such as viscosity fluctuations in the plastic melt.

### Safely eliminate errors

But cruise control in a passenger vehicles doesn’t help maintain a safe distance from the driver in front. In this case, what’s needed is adaptive distance control. A comparable situation in injection moulding is

distortion in the filling process. The solution for filling cavities evenly and consequently right up to the brim: the “ScrewPilot”. Dynamic, active acceleration and, in particular, braking directly compensate for interferences. So behind the “ScrewPilot” there’s a real, high-quality control strategy.

### For sophisticated geometries

The potential here can be seen in particular in the case of moulded parts with sophisticated geometries where for example thin-walled or small-volume areas have to be filled. To achieve this, high injection volume flows must be combined with very precise and rapid deceleration as close as

possible to the point at which the cavity is filled. Both underfilling – caused by freezing, for example – and pressure peaks as a consequence of overfilling are avoided.

A new feature here is the ability to use the “ScrewPilot” to program the injection with up to ten support points via a polygon profile. This allows smooth, controlled transitions without abrupt changes in speed. This is a particularly important feature for optically high-quality surfaces, and provides additional safety in the process sequence to ensure reproducible mould filling.



Even with sophisticated geometries, the “ScrewPilot” ensures that the filling process is stable and the part quality is corresponding high.



Explainer video  
ScrewPilot

# A golden future

arburgXworld: 2,000 mark passed in early summer



**A**lmost three years after its market launch, the customer portal reaches an impressive milestone: In early summer 2021, the 2,000th customer registered in “arburgXworld”. In total, there are even more than 6,000 active users, i.e. an average of three per company. Little wonder, as Arburg is continually updating its central portal with new digital services, which create added value and make everyday injection moulding easier.

“Digitalisation requires a pioneering spirit and strategy – both of which ARBURG is known for”, says Stephan Reich, head of IT Application Development at ARBURG, and he’s convinced of one thing: “Data is the driver of digitalisation and the gold of the future.” With the central portal, ARBURG brings valuable data, including for monitoring, analysis and documentation

of injection moulding processes, directly to the customer – available at any time and any place.

## Marketplace for digital services

“Our platform is developing into a central marketplace for plastics processors, and we are putting a lot of energy and know-how into it”, confirms Benjamin Franz, Digital Solutions team manager at ARBURG. “With our digital services and a clear strategy, customers save valuable time, increase their flexibility, create transparency and optimise processes along the entire value chain.”

Key features of the customer portal include an overview of the machine fleet (“MachineCenter”), online spare parts orders (“Shop”) and numerous digital after-sales services (“ServiceCenter”, “SelfService”). The freeformer is also already integrated into “arburgXworld”

(“ProcessLog”). One new feature is the “AnalyticsCenter” app for documenting mould trials, tests, and injection moulding processes. It will also soon be possible to easily integrate machines and peripheral devices from other manufacturers into the customer portal.



Explainer  
video  
arburgXworld



# Made for greatness!

**TB&C Mexico: Automated ALLROUNDER 1120 H produces auto**

**M**exico produces millions of components for the North American automotive market. The TB&C Group has also had a production facility in Puebla since 2010 so as to supply its regional Tier 1 customers from there in a cost-effective and timely manner. Since November 2020, the first turnkey system based on a hybrid ALLROUNDER 1120 H with GESTICA control system has been in production here.

Water channels for sliding and glass roofs are produced on the automated production cell. They are located under the wind deflector and serve both as a water drainage element and to accommodate the cable pulls with motor drive.

---

**In our sights: 250,000 parts per year**

---

The component made of glass-fibre filled PP GF 50 goes directly to a Tier 1 supplier located in the immediate vicinity. In coming years, there are plans for an annual production quantity of 250,000 parts.

It was by no means clear at the start that an ALLROUNDER 1120 H would be used to produce the water channels. Timo Arnold, COO of the TB&C Group, says: "Initially, a more powerful machine with a clamping force of around 10,000 kN was planned for series production of the water channels. But the electrically-driven toggle clamping system of the ALLROUNDER 1120 H with 6,500 kN clamping force operates dynamically, precisely and with such fast dry cycle times that we decided in favour of the ARBURG turnkey solution with our single mould." In addition, the low total energy requirement was argued in favour of purchasing the ARBURG system. "The overall package of automation, efficiency and service was simply right", says Timo Arnold.

During the production of the water channels, three feed units initially singulate a total of seven bushings, which are supplied as bulk material via vibrating conveyors. The insertion and removal module of the six-axis robot picks them up and inserts them into the mould. Beforehand, the finished part is removed and placed on the conveyor belt during the subsequent injection process.

---

**Getting a grip thanks to GESTICA**

---

The turnkey system in Mexico operates with the pioneering GESTICA control system. This features four assistance packages, and the six-axis robot is also fully integrated. According to Timo Arnold, the advantages were clear right from the commissioning: "The machine operators immediately got to grips and were able to operate the machine independently straight away." When asked about the advantages of the collaboration between TB&C and ARBURG, which has been in place since 2004, he answers succinctly: "All in one". This would apply to both the international support and the robust, process-stable and innovative injection moulding and system technology.

---

**Arburg setting the course for the future**

---

The joint future potential lies both in the area of turnkey projects and in the newly-introduced ARBURG host computer system ALS – in respect of all three locations. As regards the implementation of the ALS



## motive components



Timo Arnold, COO of the TB&C Group, is proud of the automated production of the water channels on an ALLROUNDER 1120 H.

productivity modules in summer 2021, Timo Arnold says: "The idea is to automate the reports with the ALS to first prepare important Key Performance Indicators internally." In a second step, data and reports could also be made available to customers, e.g. for a QA audit or if they want to see records of the key performance indicators (KPI). He sees the future primarily in the automotive sector: "We are experts in hybrid technology and are also increasingly using our know-how to establish our-

selves in the e-mobility market. Including with the help of additional ARBURG injection moulding technology."

### INFOBOX

**Name:** TB&C Group

**Founded:** 2004

**Turnover:** €70 million (2021)

**Locations:** Herborn, Germany, Arad, Romania, Puebla, Mexico

**Employees:** Approximately 500

**Products:** Wind deflectors, mechanisms, busbars, battery junction boxes as well as cell contact systems and hybrid components for intensive care medicine

**Industries:** Automotive, industry, medical technology

**Machine fleet:** 63 ALLROUNDERS

**Contact:** [www.hybrid-technologies.com](http://www.hybrid-technologies.com)

Optimised for multi-component injection moulding: The ALLROUNDER MORE offers significantly more space for mould and ejector.



# So much more!

## ALLROUNDER MORE: More space, modularity and convenience

**T**he first multi-component products were injected on ALLROUNDERS around 60 years ago. Since then, ARBURG has had a successful presence on the market as a pioneer in this increasingly important segment. The latest milestone: the new ALLROUNDER MORE series, which is designed for the efficient injection moulding of sophisticated multi-component parts.

The first multi-component products in the 1960s included two-tone typewriter keys and telephone dials. Today, products are manufactured with integrated functions, inserts or in a hard-soft combination.

Examples include injection moulded parts for medical technology or electromobility.

### MORE meets the highest requirements

“Our new, state-of-the-art ALLROUNDER MORE series fulfils the highest requirements for production-efficient multi-component injection moulding, right down to the smallest detail”, explains Gerhard Böhm, Managing Director of Sales and Service at ARBURG. “It enables a flexible layout and offers significantly more space for larger moulds and ejectors, more modularity in the design and a high level of ease of use.” The first machines can be ordered from

October. All ALLROUNDER MORE machines are equipped as standard with a highly dynamic electric toggle-type clamping unit with energy-efficient liquid-cooled servo motors. The machine with a clamping force of 1,600 kN and two electric injection units will start production. In the future, it will be possible to select the injection positions on a modular basis. A horizontal and a vertical injection unit (V-position) are standard. Other arrangements will be available as an option.

The new series has an easily-accessible mould area and plenty of space including for rotary units, media connections and an ejector stroke. The tie-bars have been extended by 200 millimetres as standard and





## in multi-component injection moulding

the moving mould mounting platen has also been enlarged by 200 millimetres. The distance between tie-bars is 570 x 570 millimetres with a maximum platen daylight of 1,200 millimetres. The sliding guard has also been widened by 400 millimetres. Together, all these features facilitate accessibility to the mould area.

### Ease of use

Special emphasis has also been placed on ease of maintenance and use. This includes plug-in media couplings. The cylinder module can be changed in a few easy steps. The vertical injection unit can be conveniently positioned on a support

frame and placed on the ground, or transported separately from the machine. The material feed is located outside the mould area to avoid contaminating the mould area with granules. Hose guides prevent possible chafing marks.

With its numerous improvements to details and modular design, the new ALLROUNDER MORE meets all the requirements of a modern multi-component machine. It offers more flexibility in its design and greater efficiency in the production of high-quality plastic parts.



Film MORE

# Is it all bio? Of cour

## Bioplastics: Almost 40 years of “green” ARBURG know-how

**A**RBURG was processing starch-based injection moulding granulates with ALLROUNDERS as far back as four decades ago. Countless applications and a wide variety of bioplastics followed. Today, the demand for “bio” is greater than ever – and so is the range of materials and applications.

“Bioplastics are particularly in demand when the packaging and contents can be composted together, as is the case

ARBOFORM (today 73). ARBURG is also one of ten partners participating in the BMWi funded project “Artificial Intelligence (AI) Real Lab” – an initiative of the Fraunhofer IOSB-INA and the University of Applied Arts and Sciences of Ostwestfalen-Lippe.

### Bio cups with added value

In July 2021, the SmartFactoryOWL in Lemgo began sustainable injection moulding production of CUNA brand reusable cups made of plant-based plastic.

paper mixed with water did ARBURG have to pass.

### From wood to castor oil

The processing of the wood polymer Fasal was demonstrated at Technology Days 2000. The rabbits and geese moulded as examples could be dissolved in water without waste. While previously there was a lot of odour and smoke, most processes run smoothly today. Successful wood-based products on the market include tilt



Photo: rezemo

with wooden coffee capsules”, explains Bertram Stern, Sustainability Manager at ARBURG. “Thin-walled disposable products are much more difficult to produce because biomaterial usually has different flow properties.”

Thick-walled reusable cups, on the other hand, have already been produced by the ALLROUNDER in the course of various different projects – e.g. FAIR cups “Made in Prison” from the lignin compound

“In doing so, we show how added value is created and how the ‘cradle-to-cradle principle’ works: Cups are customised according to customer requirements, can be used for years and later recycled into new products”, says Bertram Stern.

“In principle, ALLROUNDERS can process all bioplastics”, adds Christian Homp, team manager for Application Technology Consulting at ARBURG. Only when a customer brought in a bucket containing waste

Everyday products: Sunglasses made from bio-based PA12 with castor oil (l.) and coffee capsules based on wood.

control elements (today 64) and rezemo coffee capsules (today 72).

When it comes to biomaterials, a distinction is generally made between bio-based and biodegradable. Bio-based includes

# se!

Photo: stock.adobe

plastics obtained from renewable raw materials. In addition to wood, these include hemp, Chinese reed, sugar beet and castor oil from castor beans. Biodegradable plastics decompose under defined industrial conditions or in domestic compost.

### **Practical trials in the Customer Center**

There are also materials that are bio-based and biodegradable. These include Bioform V12190, which consists of 68 percent cellulose and 32 percent starch and chalk. ARBURG demonstrated paper injection moulding using the example of compostable mask holders together with the Kunststoff-Institut für die mittelständische Wirtschaft (KIMW), Lüdenscheid. The bio-based PA12 (Grilamid TR CE 4105 green), on the other hand, contains castor oil as a "green" component. The resulting plastic has the same chemical properties as a PA12 made from crude oil, and is consequently not biodegradable. An electric

ALLROUNDER 570 A produced transparent sunglasses out of it, for example.

As part of a bachelor's thesis at ARBURG, supported by the Institute for Bioplastics and Biocomposites (IfBB) at the Hanover University of Applied Sciences and Arts, a student conducted a comparison test of the following plastics at the Customer Center in Lossburg: a food-grade PHA (polyhydroxyalkanoate) with HDPE, a biodegradable PLA (polylactic acid) with ABS and a bio-PA made from 100 percent castor oil with fossil PA12. Conclusion: All three bioplastics can be injection moulded, but not on a one-to-one basis like conventional plastics from fossil sources. Instead, adjustments to the mould and the injection moulding machine are required. In each case, it is also important to dry the bioplastics properly and to adapt the injection moulding parameters and, where necessary, the screw geometry to the relevant material. "With biomaterials and recycled materials, viscosity can fluctuate",

explains Christian Homp. "In this case, smart assistance functions in the GESTICA control system provide support." For example, the "aXw Control ReferencePilot" software feature can be integrated into the control system for precise holding pressure and constant shot weights.



# This is what winners look like

## ABL: Electronic pioneer relies on ALLROUNDER

**A**BL has always been a pioneer in electrical engineering: In 1925, company founder Albert Büttner registered the patent for the Schuko plug, which is now the most widely used standard for plug devices worldwide. The entry into eMobility began in 2011 with the development of the eMH1 wallbox. This was the ADAC test winner in 2018 with a top score of 1.0 in the overall assessment. This is what winners look like – thanks to ALLROUNDERS.

Family-owned ABL, based in Lauf, Germany, has been associated with ARBURG for many years – as a supplier and as a customer.

### Wide range of ALLROUNDERS

The machine fleet comprises electric and hydraulic ALLROUNDERS, including one vertical and two multi-component machines. In addition to their high precision, the lower noise emission during production and the high achievable energy efficiency were important to ABL when purchasing the electric machines. The ALLROUNDERS produce a

ABL is one of the pioneers in wallboxes for charging electric vehicles. The eMH1 was the ADAC test winner in 2018 with the top score of 1.0.

wide range of items and components for the “Connectivity” and “eMobility” product areas.

### Charging solutions for every situation

“Our charging stations are used in the private, commercial and public sectors all over the world, as we offer charging solutions for all common cases of application”, says Managing Director Sabine Spiller-Schlutius about the latest, most dynamic – and now largest – product area.

For the entire portfolio, ABL uses moulds with up to 16 cavities, depending on the component size and complexity. The majority are cold runner moulds, some moulds also work with hot runners and direct gating. “We purchase our moulds exclusively from mould construction makers in Germany so as to maintain a correspondingly high level of quality”, she says.

### Quality from start to finish

The moulded parts are produced in three layers and are either collected as they fall out directly at the machine in containers, or removed and stored by robotic systems. Quality control is carried out by the employees at regular intervals during production. At the start of a production order, the component data is compared with the component drawing in accordance with the four eyes principle. Items with particularly high quality requirements are subject to a 100 percent inspection.

### Bio-based plastics and recycled materials

What began in the area of Schuko plug-in devices is now continuing across all production areas: Tests with the processing of bio-based plastics and recycled materials on ALLROUNDERS have yielded promising results and triggered plans to increase the use of such materials. According to Sabine Spiller-Schlutius, the product portfolio and applications make this possible.

### INFOBOX

**Name:** ABL Bayerische Elektrozubehör GmbH & Co. KG

**Founded:** 1923 by Albert Büttner

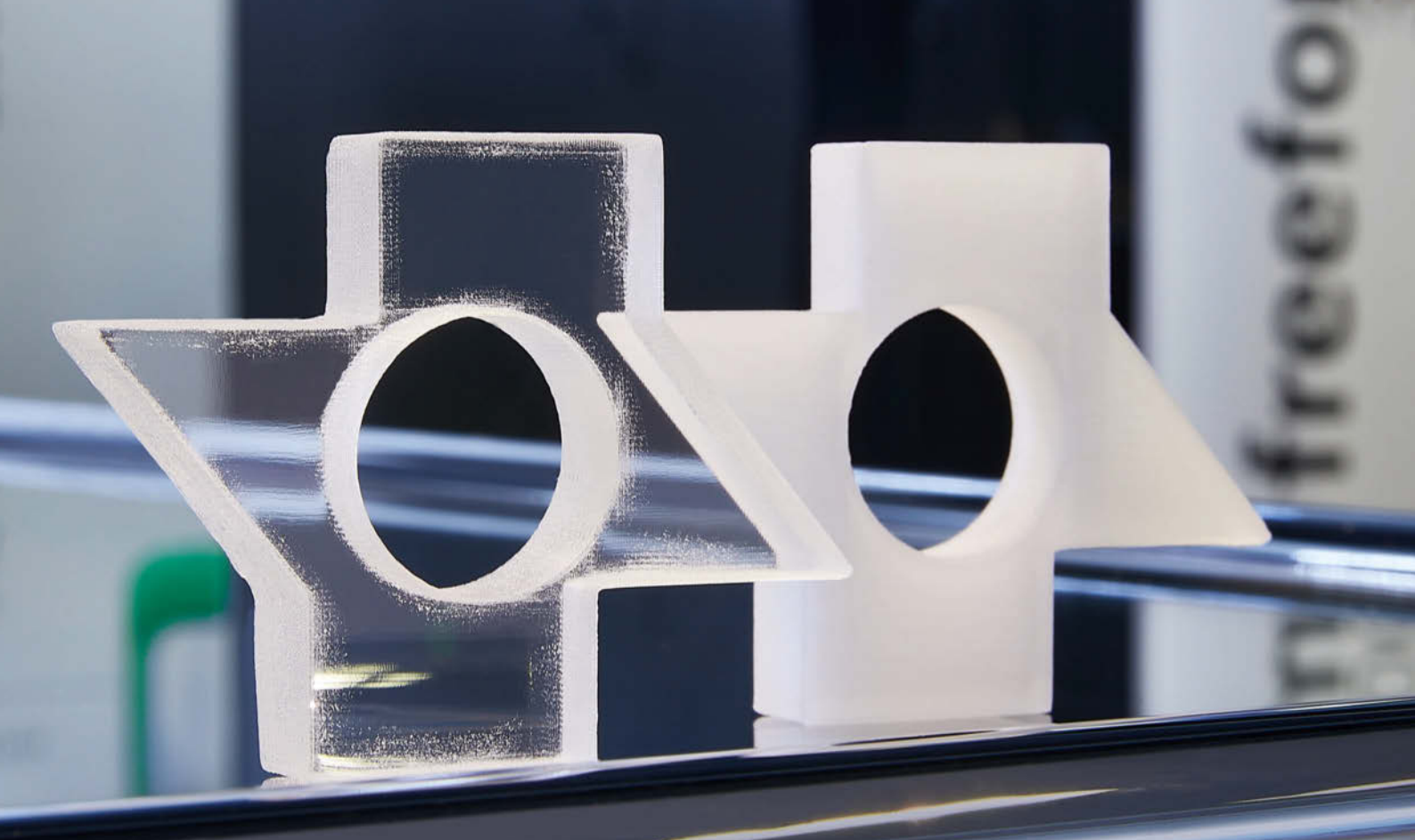
**Location:** Lauf, Germany

**Employees:** 460

**Products:** Plug and socket outlets, combinations, caravan power supply units, wallboxes and charging stations

**Machine fleet:** 28 injection moulding machines, of which 20 ALLROUNDERS

**Contact:** www.abl.de



# Customised biorea

Neue Materialien Bayreuth: EU joint project can only be imple

**T**he EU joint project “AMBioVessel” concerns the production of additively manufactured bioreactors. The special feature: The design, transparency and biocompatibility of the bioreactors must be precisely tailored to the relevant area of application. Neue Materialien Bayreuth GmbH has the right additive manufacturing system for this in its portfolio with the freeformer and the ARBURG Plastic Freeforming (APF).

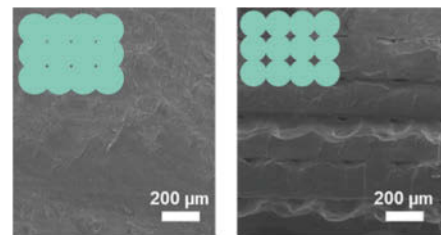
Neue Materialien Bayreuth GmbH (NMB) in Bayreuth, Germany, is a non-university research institution and develops novel material variants and associated energy-efficient processing methods, among other things. As a specialist for thermoplastic and metallic 3D printing processes, NMB acts as a partner for material and process development in the “AMBioVessel” project. Other cooperation partners include PreSens

Precision Sensing, Applikon Biotechnology (part of Getinge) and Levitronix, as well as the Zurich University of Applied Sciences.

NMB has had a freeformer 200-3X in the Democenter for additive manufacturing since 2016. There are also other processes such as selective laser melting (SLM), selective laser sintering (SLS) and fused filament fabrication (FFF).

## APF meets all requirements

But only ARBURG plastic free moulding was considered for the project. Dr. Julia Gensel, Team Leader for Additive Manufacturing in the NMB Plastics Business Unit, says of the advantages of the freeformer in this project: “In bioreactors, the individual customisability of the geometry combined with transparency and biocompatibility is of crucial importance for the cell cultures cultivated in them. With the freeformer, all three requirements can be



Whether the components are transparent or not (large image) depends on how closely the drops are placed. Microscope images (small images) provide information on this.

realised simultaneously.” This is crucial for medical and pharmaceutical research, for example, in order to increase the yield of cell products and accelerate bioproduction in the future. This would lead to practical advantages, for example, in cell therapy or in the production of active substances in pharmaceuticals.



Photos: NMB

Andressa Seefeldt, head of the AMBioVessel project, and Marcel Dippold, research assistant, are happy to be able to meet all the requirements of the bioreactors with the freeformer.

SPONSORED BY THE



Federal Ministry  
of Education  
and Research

The "AMBioVessel" joint project – 3D-printed, customised bioreactors for pharmaceuticals and medicine – is funded by the German Federal Ministry of Education and Research (BMBF) and the European Commission as part of "Eurostars" (project no. 01QE2016B).

# ctors

## mented with freeformer

Marcel Dippold, research associate at NMB, says of the collaboration with ARBURG: "Particularly in the development phase of these mini disposable bioreactors, the combination of qualified plastic granulate with individually adjustable process parameters is crucial, which makes the freeformer the solution in this area. We also benefit from the lively exchange of data with ARBURG, allowing us to qualify innovative materials quickly and efficiently."

### Future multi-material use

A biocompatible, amorphous thermoplastic is currently processed on the freeformer. While the quality of the inner structure is very homogeneous and high quality due to the targeted adjustment of the process parameters, the outer surface must be reworked to achieve the required transmittance of over 90 percent. This is done by post-processing in a special facility

at NMB. Solvent vapour is used to smooth the surface of 3D objects evenly from all sides. In the future, a second step, a chemical-optical sensor system, introduced into the bioreactors via multi-material processing, will enable monitoring of the cell cultures. Project manager Andressa Seefeldt says: "The users of the bioreactors can then tell exactly how the cells are doing in the bioreactor."

### INFOBOX

**Name:** Neue Materialien Bayreuth GmbH  
**Founded:** 2000  
**Location:** Bayreuth, Germany  
**Machine fleet:** Extrusion and powder-based additive manufacturing systems, one freeformer  
**Contact:** [www.nmbgmbh.de](http://www.nmbgmbh.de)



# Get smart

## Turnkey: Refining and separating cups by type

**D**igitalisation and automation increase production efficiency. But that's not all: This combination also offers enormous potential for the circular economy. New standards are being set here by a "smart" turnkey plant as part of the R-Cycle initiative.

The production of printed cups is an example of how plastic products can be manufactured with process reliability, finished inline, fully traceable and separated by type – thereby closing the cycle of recyclable materials.

The key component of the turnkey system is an IT-networked electric ALLROUNDER 370 A with a clamping force of 600 kN, standard IIOT gateway and the pioneering GESTICA control system. Added to this is a MULTILIFT V 20 linear robotic system that removes the cups and feeds them to the plasma treatment and digital printing station. There they are finished with a picture motif previously selected via tablet and receive two DM codes. The process data for traceability can be called up via one of these codes, and relevant material information for recycling via the other.

### 100 percent traceable

The ARBURG Turnkey Control Module (ATCM) SCADA system visualises the system's important functions and combines the process and quality data for specific parts. To achieve this, the injection moulding machine, automation systems and peripheral equipment – in this case, the digital printer – each send all relevant data to the ATCM. This allows the production processes to be seamlessly documented, and each individual cup can be 100 percent traced via the first DM code.

### Digital product passport

As the exclusive mechanical engineering partner of the R-Cycle initiative, ARBURG also demonstrates in this application how the cups can be separated by type in a recycling system after the use phase. To achieve this, each plastic product receives a so-called digital product passport. The pivotal element of R-Cycle is a database that contains all the information about the materials used. As early as the injection moulding stage, the ATCM transmits data such as raw materials and colouring agents. By reading the marking through

the second DM code, the materials can be separated by type. This allows high-quality recycled material to be obtained from the plastic waste and returned to the cycle. In July, R-Cycle was awarded the 2021 German Award for Sustainability Projects in the "Packaging" category.



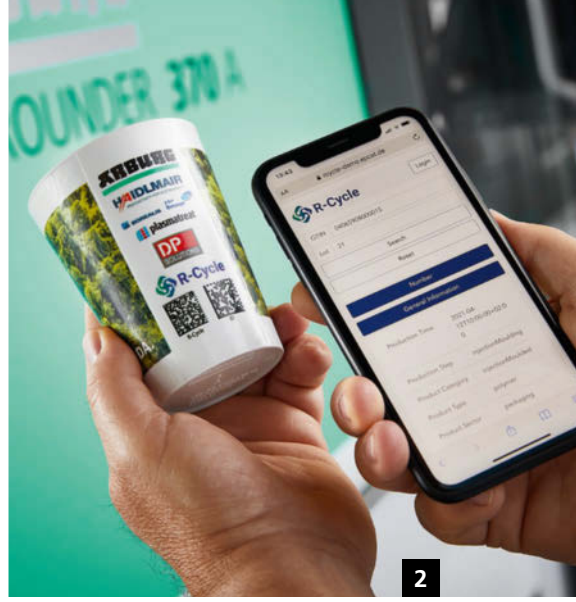
Film cups

The cups (1) are made on an ALLROUNDER 370 A (3). The injection moulding is followed by plasma treatment (4) and digital printing (5). Information collected by the Scada system ATCM (6) on the material (2) and the injection moulding process can be accessed via the printed DM codes.





1



2



3



4



5



6



## TECH TALK

Dipl.-Ing. (BA) Oliver Schäfer, Technical Information



# We want to find out!

## Melt compression: Important parameter for the injection moulding

**O**ne parameter, the importance of which many underestimate for the injection process, is the compression of the melt. In order to be able to offer customers specific assistance in this area, experts from ARBURG's application technology department have systematically investigated the subject.

Melt compression has a specific impact on the design of the mould and injection unit – especially in hot runner systems with a large melt volume in relation to the moulded part weight. This applies, for example, to cube moulds, but also to the field of micro injection moulding.

But why is melt compression often overlooked in the design? One reason: There is

an absence of reliable calculation bases to secure and check the specifications with regard to compression during specification of the injection unit. Frequently, not even the compression values specific to each plastic, which describe the behaviour of the plastics in the interaction of pressure (p), specific volume (v) and temperature (T), are used from the established pvT diagrams available.

This means that, in respect of melt compression, the injection units are designed on a very general basis only, based on empirical values. If, on the other hand, the compression is calculated before the machine is designed, the size of an injection unit can be determined more precisely, which has a positive effect on its cost-effectiveness.

### Based on practical experiments

To discover the effects that calculation of the melt compression can have on the physical design of machine components, experts from ARBURG Application Technology conducted tests to determine the compression in the plastic melt. The basis for scientifically substantiated results was the consideration of the most important components of the injection moulding process: injection unit, machine nozzle, hot runner system and mould cavities. At the same time, different approaches to the pvT calculation of individual plastics were given theoretical consideration. For this purpose, a tool was developed that calculates the compression of different plastics depending on temperature, pressure and volume for the specific



Photo: stock.adobe

## process

application. The results of the tests were then compared with the calculated values of melt compression.

---

### **Methodology for precise dimensioning**

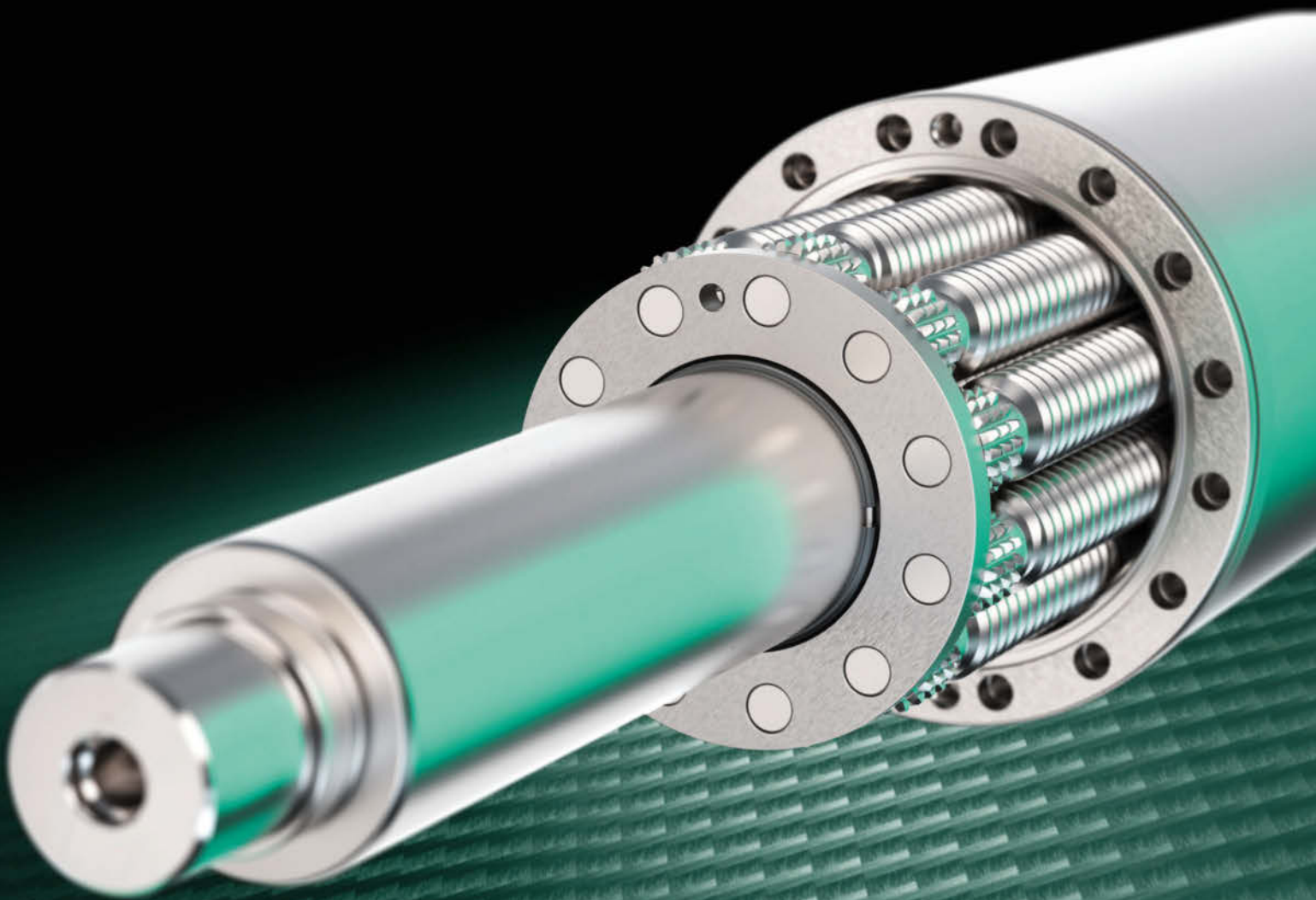
---

The result: The tests and calculations confirmed the dependence between compression and volume. In fact, more often a larger volume must be taken into account than that calculated in the design on the basis of the shot weight alone. The rule is: The higher the pressure, temperature and volume, the higher the compression. In addition, it was possible to implement a substantiated methodology that efficiently assists in the selection of plasticising components. If the customer's moulded part,

mould and hot runner design are known, compression is also taken into account in the machine design. This means that the ALLROUNDERS can be matched even more precisely to the individual process before purchase, and investment and production can be made extremely cost-effective.

It pays to take a close look: As with detective work, all important details should be scrutinised during injection moulding. This includes, for example, compression of the material while creating the precise design of the injection units.

QUALITY SEAL  
HIGH PERFORMANCE  
5-YEAR WARRANTY  
**POWER DENSITY**  
SUSTAINABLE PRECISE  
DYNAMIC  
QUIET



**WIR SIND DA.**

Do you know what actually has a lasting impact? The power density of your drive! The planetary roller screw drive of our hybrid and electric ALLROUNDERS is the best you will find on the entire market, and not just in this respect. Make sure you get the best results! In terms of noise emission, cooling, power transmission, load capacity, compactness, and spare parts supply – we deliver, right across the board. And on top of that there's a five-year warranty. Our planetary roller screw drive: one of a kind!  
[www.arburg.com](http://www.arburg.com)

**ARBURG**