

# today

The ARBURG magazine

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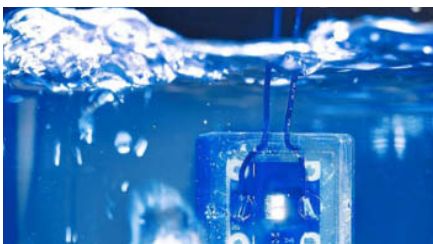
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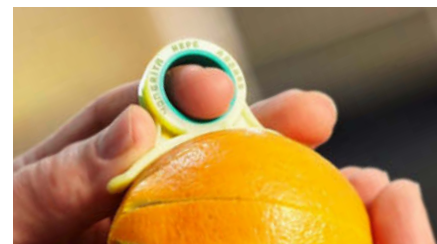
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## IMPRESSUM

**today, the ARBURG magazine, issue 54/2014**

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ARBURG technology brings action into the kid’s room: The bworld figures from Bruder toys are produced on four-component ALLROUNDERS and, thanks to their joints, can be made to sit, kneel and even grasp with their hands.





## Dear Readers,

Following an extremely exciting and successful year in 2013, we have hit the ground running in 2014. This year will again be characterised by a number of product innovations and enhancements. These include the market introduction of the freeformer, which delighted the trade public at the K and Euromold trade fairs. In order to demonstrate its potential, the present edition of "today" describes the type of products and the quality achievable using the ARBURG Plastic Freeforming process.

The brand new freeformer, which we are currently presenting at the Lossburg headquarters, represents a significant milestone in the history of ARBURG. To reflect this, we have completely redesigned our "Evolution" exhibition to allow visitors to experience our history

interactively, as well as looking ahead to the future.

We are looking forward with great anticipation to the initial feedback from the Technology Days.

With regard to the future, an important personnel change awaits us in April. After 50 years of service to ARBURG, our Managing Director Technology & Engineering, Herbert Kraibühler is entering into well-deserved retirement. We have not, however, left anything up to fate here and have already found an outstanding successor in the person of Heinz Gaub, whom we will be introducing in this edition.

A host of interesting articles also awaits you on the following pages, providing fascinating insights into a variety of companies.

I hope you enjoy reading our new issue.

A handwritten signature in blue ink that reads "Renate Keinath".

Renate Keinath  
Managing Partner & Managing Director

# First-class

## Technology Days 2014: Allround efficiency – from one-off parts



**Every spring, the Technology Days attract more than 5,000 trade visitors from around the world to Lossburg. This year, the main focus is once again on production efficiency. With more than 40 exhibits, the Efficiency Arena, specialist presentations and individual expert discussions, ARBURG offers its customers a comprehensive know-how transfer, from 19 to 22 March 2014.**

At the Efficiency Arena, visitors will discover how plastic products can be produced production-efficiently, in optimum quality and at the lowest possible unit costs.

### **Efficient: from one-off parts to high-volume production**

Based on examples of efficient operations, various aspects of production efficiency will be elucidated and the relevant production solutions presented. The spectrum extends from one-of parts through to high-volume production. One-off functional components can be produced using the new ARBURG system for

additive manufacturing, the freeformer.

Automation solutions will be presented for medium batch sizes. These involve a combination of human and machine for a high degree of flexibility during complex insertion tasks and cycle time optimisation with the fast-entry MULTILIFT V robotic system.

For large-volume production, a high-speed electric ALLROUNDER 470 A will demonstrate how 64 complex precision parts can be produced in a cycle time of only 1.8 seconds. Moreover, the topic of Industry 4.0 will be covered in detail based on a practical example.

### **Supporting expert presentations**

Supporting expert presentations will offer visitors an opportunity to enhance their knowledge regarding the SELOGICA control system, ARBURG Plastic Freeforming (AKF), the overmoulding of organic sheets and the topic of Industry 4.0. Exhibition areas on the robotic system range and on the service offerings, as well as factory tours will make the Technology Days a varied experience

Individual consulting and knowledge transfer are important aspects of the Technology Days (photo above). The entire spectrum of cost-effective plastic parts production will be displayed in the Efficiency Arena, (photos at top right, left to right): from additive manufacturing of a one-off part using the freeformer and the automated overmoulding of inserts, through to high-speed, large-volume production.

will offer. With more than 40 exhibits, ARBURG offers a unique overview of efficient plastic processing. ARBURG experts from different departments will present some interesting topics covered by the Technology Days 2014.

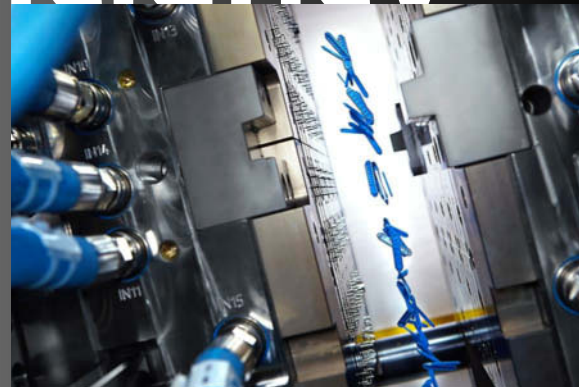


Impressions



to high-volume production

# Examples efficiency



Dr. Oliver Keßling,  
Department Manager  
Plastic Freeforming



Oliver Giesen,  
Department Manager  
Projects



Dr. Thomas Walther,  
Department Manager  
Application Technology



“Since celebrating its world premiere at the K 2013 trade fair, the freeformer has delighted mould makers, designers, product developers, service providers and, above all, our customers. Just how the innovative system for additive manufacturing fits seamlessly into our product range will be shown in the Efficiency Arena. With this application, functional one-off parts or small-volume batches can be produced from standard granulates, without a mould, using 3-D CAD files. Furthermore, we will be exhibiting sophisticated applications covering a variety of material combinations as well as the production of complex geometries without the need for support-structures by means of a 5-axis component carrier.”

“In our department, visitors will find competent contact partners for the design and implementation of turnkey solutions. Production efficiency is also a major focus for us and we will be presenting a highly flexible production cell involving human and robotic interaction at the Efficiency Arena. In one example, an operator will perform complex insertion tasks in collaboration with a MULTILIFT V robotic system. On view for the first time at the Technology Days will be a new option for our MULTILIFT V. Its vertical movement into the mould is around 30 percent faster than previously, as we will demonstrate based on an example of a thin-walled packaging article.”

“The presentation of innovative applications and process trends will show our customers efficient injection moulding solutions as an overall package beyond the machine technology itself, in cooperation with first-class partners. Further highlights include the sophisticated lightweight construction processes such as Particle-foam Composite Injection Moulding and the overmoulding of organic sheets. On an industry-specific basis, we will, for example, demonstrate a high-speed thin-walled application, electric cube-mould technology, the production of pipette tips and flat drippers, as well as the injection moulding of optical components.”



Herbert Kraibühler (right) passes the "technology relay batons" to his successor Heinz Gaub.

# Smooth transition

## New Managing Director Technology & Engineering Heinz Gaub succeeds Herbert Kraibühler

**ARBURG is well known for its long-term strategies – also in personnel terms. The succession to Managing Director Technology & Engineering Herbert Kraibühler, who is retiring at the end of March 2014 following 50 years of service at ARBURG, has therefore been planned well in advance. With Heinz Gaub, a successor has been found who meets all the prerequisites for the position.**

“The wise adage of ‘stopping at one’s peak’ applies precisely to me,” says Herbert Kraibühler about his requirement, citing the freeformer as a major highlight of his career, which began as a trainee machine fitter at ARBURG in 1964. Next, he studied precision engineering in Karlsruhe, specialising in plastics technology, before starting in the Development department at ARBURG. His further professional path led him to various posts until he assumed the position of Managing Director Technology & Engineering in 1996.

### Development of products and strategies

Over the course of the five decades, he continuously furthered the development of injection moulding technology, extending the product portfolio to include additive manufacturing with the freeformer. Close cooperation with universities and research institutes played an important role for him throughout. Further significant technological milestones he mentions include the electric ALLROUNDER and the SELOGICA control system. “The oil crisis in the 1970s was a decisive turning point in terms of market developments. Previously,

machines with delivery times of two years were “spread around” among the customers, so to speak. Then, suddenly, the machines had to be actively sold and customer requirements increasingly gained in significance. Thanks to its modular product range, ARBURG was able to master this new challenge to perfection,” he reminisces proudly, emphasising “the ability to listen” in this context as the decisive trait in order to configure machines tailored to the customer’s requirements as well as anticipating changing market requirements at an early stage. The best example of this is the freeformer, which meets the requirements for individuality and flexibility in plastics processing.

### Customer proximity is key

For the new Managing Director Technology & Engineering, Heinz Gaub, who has been preparing intensively for his duties since the summer of 2013, customer proximity is the highest priority: “Herbert Kraibühler’s strategy of maintaining close contacts to the customers and to jointly devise new technical solutions with them is something I’ll be certain to continue. Accordingly, I’ll have to learn in depth about the field of plastics processing, which is still a new discipline for me.” Heinz Gaub is already extremely well versed in machine engineering. He studied mechanical engineering, specialising in production technology, at the Technical University of Berlin, as well as completing an MSc at the Massachusetts Institute of Technology in the US. He has since gained 15 years of experience in executive positions at industrial companies in the machine construction sector,

four years in management at the German Standardisation Institute (DIN) in Berlin, as well as providing consulting to holding companies as an independent industry expert.

### Convinced by the ARBURG philosophy

“I’ve always felt an affinity for internationally operating, medium-sized, family-owned industrial companies,” says Heinz Gaub. This view is based on the fact that in this environment it is possible to shoulder responsibility and to work in close cooperation with the owners and the workforce in order to drive the company forwards. He sees decisive advantages in ARBURG’s centralised production location. “We don’t produce machines for specific markets. All the ALLROUNDER machine series and sizes are used worldwide.” Producing the entire range at several locations would therefore make little sense. “The fact that all the decision-making instances are under a single roof also enables efficient communication, saving time and costs.” The philosophy of maintaining a level of in-house manufacturing of over 60 percent also results in cost benefits according to Gaub. “Because we manufacture the key components in-house, our entire know-how can be drawn upon, which directly benefits our customers – with proven technology and the ability to devise customer-specific solutions,” says the Managing Director Technology & Engineering, looking to the future with optimism.

# Pioneering concepts

Festo: ARBURG Energy Efficiency Award 2014 for global leader in



Photo: Festo/Composing ARBURG

**S**ince 2008, ARBURG has annually presented an award to a company for outstanding activities in the field of energy efficiency. Important aspects here include a holistic approach and future-oriented concepts. In 2014, Festo, the leading global supplier of technology for factory and process automation has won the ARBURG Energy Efficiency Award. The reasons for the award are the conception of the company's new plastic parts production facility, which is fully geared towards energy efficiency, as well as cooperation on the freeformer.

The intensive business relations between the two family-owned companies,

Festo and ARBURG, have grown over 30 years with know-how being exchanged beyond the product level. "The new Festo plant and the cooperation on the freeformer have made an important contribution to the future-oriented enhancement of energy and production efficiency and were therefore decisive for presentation of the ARBURG Energy Efficiency Award 2014 to Festo," says Herbert Kraibühler, ARBURG Managing Director Technology & Engineering.

## Energy-optimised production

In 2012, Festo decided to set up a plant with a completely new polymer production facility and a focus on energy efficiency,

Thanks to its new energy-efficient plant and its cooperation on the freeformer (photos on right), Festo has won the ARBURG Energy Efficiency Award 2014 (photo above). One particular example of additive manufacturing is the "bionic handling assistant" (photo above), for which Festo was awarded the German Future Prize 2012, which is presented by the Federal President for achievements in innovation and technology.

the Global Production Centre Hassel, at its St. Ingbert location in Saarland. All the important factors in terms of the building, production and machines are taken into account here. "Thanks to its many years



# automation technology

of know-how in this sector and its holistic approach, ARBURG was an important advisor and partner for us in this area," explains Klaus Hilmer, Head of Polymer Technology at Festo.

## Analysis of the machine fleet

The two companies jointly examined the 45 ALLROUNDERS for thermoplastic and 12 vertical ALLROUNDERS for elastomer processing in detail with regard to energy requirements and production efficiency. ARBURG was then tasked with devising optimal machine concepts. For the thermoplastics, electric ALLROUNDER ALLDRIVE machines were selected, which were specially configured to meet the requirements at the Hassel plant. For the elastomers, the machines are to be converted to speed-regulated pump drives.

## New concept for injection moulding sector

The key elements of the holistic concept also include insulation of moulds and plasticising cylinders, optimisation of material pre-drying and feed through a central

efficient solution, and waste reduction e.g. through lower sprue weights and fewer hot runner connections. Due to the nature of the products, the temperature levels were selected so that cooling is only necessary during midsummer, meaning that heat recovery can be dispensed with.

## Experts in additive manufacturing



Owing to its many years of wide-ranging experience in the additive manufacturing of prototypes and one-off parts, Festo was already supplied with a freeformer in early 2013 in order to subject it to in-depth testing from a user point-of-view. "The results and feedback from the testing provided us with valuable information for optimisation and further development," explains Herbert Kraibühler. Klaus Müller-Lohmeier, Head of Advanced Prototyping Technologies at Festo outlines the benefits compared to other processes as follows: "Because the freeformer doesn't process specially prepared plastics, a very broad range of materials are available and two-component parts are also possible. Because it operates dust and emission-free, no complicated infrastructure with extraction systems is required,

which has a positive impact on occupational safety and energy efficiency." The expert sees its use at Festo in the areas of prototyping and, after subsequent further development, in small-volume production.

## INFOBOX



**Founded:** 1925

**Divisions:**

Automation (automation technology) and didactics (learning systems, training and consulting)

**Turnover:** 2,24 billion euros (Group), of which more than seven percent accounted for by R & D

**Employees:** Around 16,200 worldwide (Group).

**Products:** Around 30,000 catalogue products in several 100,000 versions, approx. 10,000 tailored customer solutions annually, pneumatic, servo-pneumatic and electric automation technology, industry-related qualification solutions and industrial consulting

**Locations:** Companies in 61 countries, more than 250 subsidiaries, authorised agents in a further 39 countries, service in 176 countries worldwide

**Customers:** More than 300,000 in 176 countries

**Contact:** [www.festo.com](http://www.festo.com)



Photo: Festo



# Helping people back into action

## Otto Bock HealthCare Group: Mobility for

**P**eople with disabilities often suffer in two respects: their mobility is impaired and they are also deeply affected psychologically by their situation. With its medical products and services, the Otto Bock Group, based in Duderstadt, Germany, wants to help people around the world to regain their mobility. This is because being able to move better has a positive influence on their quality of life.

The German company Otto Bock HealthCare GmbH is the flagship of the Otto Bock Group. This company comprises five divisions,

Prosthetics, Orthotics, Neurorehabilitation, Mobility Solutions (wheelchairs and rehabilitation products) and Patient Care & Business Service. It offers its customers a broad range of products, adapted system

solutions and comprehensive services.

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### High-tech prostheses from Vienna

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Austrian company Otto Bock Healthcare Products GmbH is one of the most significant research and development locations within the Group. Mainly high-tech prostheses are produced in Vienna. Around a third of the 580 employees are involved in R & D activities. The principal aim here is to overcome the disparity between natural body function and artificial substitute with the aid of mechatronics, computer control, micro-processors, micromotors and sensors.

The aim is to facilitate faster and more natural movement sequences in order to permit a high degree of mobility and, ideally, even the continuation of a variety of sports activities as well as complex movement sequences such as climbing stairs.

Key terms in this field include the C-Leg®, the first fully micro-processor controlled leg prosthesis system worldwide, the DynamicArm®, an arm prosthesis controlled via electrical muscle impulses, or the orthotic C-Brace® system, the objective of which is to enable people suffering from paralysis to step out of the wheelchair into a mobile life on two legs. In June 2012, a new production building in Vienna was moved into, which expands the total production floorspace by some 10,500 square metres. A further extension of the same size is planned for

# le ve lives

## people – quality for life

Research and Development in order to further strengthen the production location.

### Ottobock – a renowned brand in sports for the disabled

The company's commitment to sports for the disabled is enshrined in its corporate philosophy. As athletes and role models, people with disabilities demonstrate that the courage to face life can be fostered through sporting activities. Since 2005, the company has been a cooperation partner of the International Paralympic Committee (IPC) and has extended this contract beyond the Paralympics to be held in Rio de Janeiro in 2016. In London 2012, a team of 78 international orthopaedic technicians were in attendance and carried out a total of 2,078 repair jobs. Furthermore, international events and symposia in conjunction with the IPC and universities serve as an important driver for the further development of high-end prosthetics for top athletes.

### Plastics in prosthetics

Particularly in the field of orthotics and prosthetics, plastics are widely used on account of their basic characteristics. Plastic products are lightweight, exceptionally versatile, have interesting tactile properties and are (particularly when filled with additives) able to withstand even long-term loads.

Ottobock makes widespread use of injection moulding technology and, accordingly, of the ALLROUNDERS for



Photos: Otto Bock

the production of micro, as well as larger plastic components. In Vienna, the company works exclusively with ARBURG injection moulding machines. In total, five machines (primarily small ALLROUNDER C and S machines) in the clamping force range between 150 and 600 kN are in use here. An interesting fact is also that two decades-old C4b machines are still in operation here for producing simple parts. Andreas Tabacco, Department Manager at Ottobock in Vienna explains: "The machines just carry on performing their tasks without a hitch and are therefore characteristic of what ARBURG offers: robust, high-quality machine technology that continues to produce our small-volume batches even after many years, or in this case decades, combined with an individual service that's always available when you need it."

Among other parts, these machines produce components for the high-end hand and knee prosthetics Michelangelo und Genium. The electrically driven Michelangelo hand is able to perform no less than five types of grip, is aesthetically

The prosthesis on the right arm (photo on left) is indiscernible at first glance. For many of these artificial limbs, even the tiniest parts are produced on ALLROUNDERS. The Michelangelo hand (photo above), is equipped with the so-called SUVA sensor system, which ensures precise movements, positioning and pressure.

shaped and highly mobile. In physiognomic terms, it therefore comes very close to a natural hand.

For reasons of weight, tactile properties, formability and loading capacity, reinforced plastics are mainly used. Reinhard Zlabinger, responsible for injection moulding explains: "We produce semi and fully automatically, unmanned, and in all working positions. We also inject into the parting line. This is why our ALLROUNDER 320 S is configured as a two-component machine in order to, for example, first overmould inserts and then complete them with a further, soft component. All of our moulds are designed so that every part can be produced on any of the machines. So we work in a very flexible manner."



Photos: Otto Bock

At Ottobock in Vienna (photo on left), a wide variety of parts are produced in small batches. Thanks to their great flexibility the ALLROUNDERS meet these requirements. The intelligent Genium leg prosthesis system (photo below) is simple, intuitive and flexible in real-time use thanks to a microprocessor-controlled knee joint – depending on the situation, it can even anticipate movements in a manner akin to natural walking.

Quality is the top priority. Complex moulds are always built in-house, standard moulds are also sourced externally. Particularly thin-walled items and fibre reinforcement with glass or carbon represent a challenge for the mould designers, for instance in terms of filler level and porosity. Reinhard Zlabinger explains: “We produce a wide variety of parts in small batches using both vertical and horizontal applications. The machine technology therefore has to be multifunctional. Today, we process 70 materials, mostly thermoplastics, in 35 different colours and rely on visual checks for many of our inserts. We dispense with fast cycles in favour of quality. We also employ the full range of quality assurance measures, such as manual and automatic part measurement using coordinate measuring machines, as well as functional and mechanical assembly tests to ensure good day-to-day usability.”

**Cooperation over 40 years**

Ottobock and ARBURG have been cooperating for more than 40 years. Initially, machines were relocated from Germany to Austria, where the first

ALLROUNDERS were then purchased in 1993. On the subject of the machines, Reinhard Zlabinger confirms them to be extremely reliable and exceptionally low-wear, adding that, “Over the years of cooperation, we have found solutions for every possible task.

The competence of the ARBURG staff on the service phone is extremely valuable to us. Our brand loyalty has resulted from our satisfaction with both the technology and the service.”

**The future is intuition**

When questioned about future developments, Andreas Tabacco answers as follows: “Our future clearly lies in the progressive replacement of prostheses for targeted and selective uses in favour of intuitively controllable ‘artificial limbs’. Simultaneous sequences will become increasingly important and render the movements more natural. This is the objective of our research and production – for which our ALLROUNDERS are indispensable.”



**INFOBOX**

**Founded:** 1919 in Berlin, currently headquartered in Duderstadt, Germany, since 1969, Otto Bock Healthcare Products GmbH in Austria  
**Owner:** Managing Partner Prof. Hans Georg Näder  
**Company:** Ottobock Group with HealthCare, Plastics (Chemical) and Sycor (IT) divisions  
**Turnover:** 2012: Ottobock Group, 792.2 million euros, Ottobock Healthcare (DE) 664.7 million euros, Ottobock Healthcare Products (AT) 95 million euros  
**Employees:** 2012: Ottobock Group worldwide, more than 5,900, Ottobock Healthcare (DE) more than 5,200 Ottobock Healthcare Products (AT) 580  
**Products:** High-tech prostheses, wheelchairs, therapeutic and other healthcare products  
**Contact:** www.ottobock.de

# Total transparency

## Electronic machine file: Quick access for fast service

**T**he fact that in today's digital world, numbers, data and information on customers and their machines are still kept in the form of hard copy files is almost an anachronism. The disadvantages of this form of archiving are evident: no central access to operational data by different departments, redundant data collection and administration, resulting in delayed response times to customer queries. At ARBURG, this age belongs firmly in the past, thanks to the digital customer and machine file, which permits retrieval of all the data in a transparent manner worldwide, rendering service faster and more effective.

Implementation of an interdepartmental, global data pool for customer and machine-related information not only leads to more effective cross-department processes, but above all to faster access to information. This means that a complete overview is available to all the employees dealing with a particular customer, order or special machine." A great deal of positive feedback from customers confirms that introduction of the digitalised data at

a centralised location has also benefited the Service department.

### Customers appreciate fast assistance

The companies using our services have noticed that the ARBURG specialists on the phone have been able to assist them even better, faster and more comprehensively than ever before in the event of maintenance or spare-parts queries. And, after all, that's precisely what counts with service. Fast assistance, whenever it's needed. As a result, machine downtimes are effectively reduced, allowing operations to run smoothly again.

### Clear advantages in terms of service

Eckhard Witte, Service Divisional Manager at ARBURG, believes that the new system brings clear benefits for after-sales service processing: "Thanks to the central storage of all the relevant data, we can always access the most up-to-date documents, even when we're on the road. This provides us with a comprehensive overview across all the national and international departments, allowing us to respond to queries and orders even faster

The electronic machine file provides transparency with regard to every ALLROUNDER, ensuring that assistance is quickly at hand in an emergency.

than before. This new capability helps us to improve our services, which is, after all, what customers appreciate about the overall ARBURG package. We've consequently received positive feedback, especially because, based on the machine history data for example, we can immediately tell our customers precisely what spare parts they require or give them valuable tips based on the detailed information available under the relevant machine number. This is how a perfect service has to work today."

# Put to the test

## freeformer: High-quality functional parts



**D**uring its world premiere at the K 2013 trade fair, the freeformer created a sensation among the international trade public. Soon afterwards, at the Euromold, the additive manufacturing experts were equally enthusiastic. The quality of the functional plastic parts produced on the freeformer are impressive, as subsequent testing proves.

“One of the first samples we manufactured additively with the freeformer was a simple tensile rod”, explains Dr. Oliver Keßling, who heads the Plastic Freeforming department. Together with an expert team, he optimises the innovative freeformer, which builds up the components droplet-by-droplet with melt-

ed standard granulate without a mould from 3-D CAD files using the ARBURG Plastic Freeforming (AKF) process (see today 53, p. 7 ff) to produce one-off parts or small-volume batches. The progress made in achieving complex part geometries is impressive. Milestones in 2011, for example, include a planetary gear set with precisely engaging gears, a hollow Easter egg produced without the use of support structures and a chess board made from two components.

### Discovering new applications

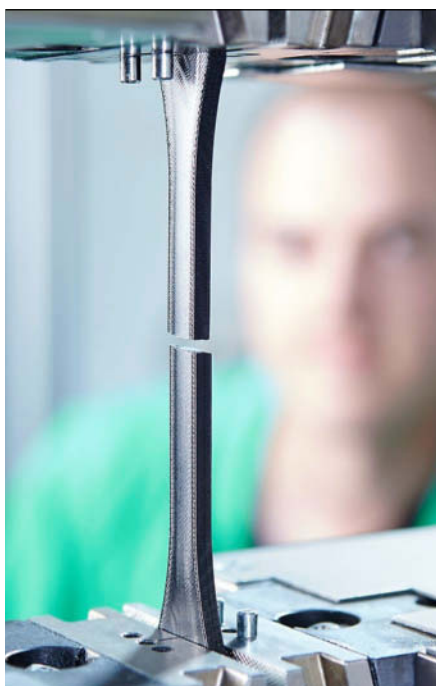
“One example of a hard/soft combination is a clip made from ABS and TPE, which can be reversed by twisting. No other additive manufacturing process is able to achieve this – not even injection mould-

During the qualification of materials and the design of components, ARBURG works closely with the freeformer users (on left in above photo).

ing!” says the ARBURG expert. “We are currently investigating various possibilities: how a housing with flanges can be reinforced, for example.” Because although the freeformer offers virtually limitless freedom, there are still some complex geometries which cannot easily be implemented using our system. “Ideally, considera-



Process principle



Tensile tests (photo on left) and macro images (bottom photo) provide evidence of the quality of complex AKF products (photos above).

tions should be made at the development stage to determine how the component can subsequently be built up from the bottom up, wherever possible without a supporting structure. We therefore also pass on our know-how to the users and collaborate with product designers."

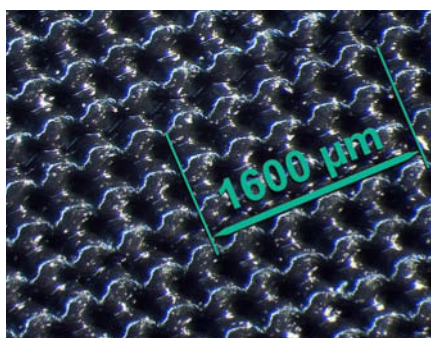
### **Tensile strength of at least 80 percent**

Material strength is measured by means of tests using large tensile rods in accordance with the DIN EN ISO 527-1 standard. With ABS, this is around 80 percent of that for injection-moulded parts. For PC, the figure is over 90 percent, "which is more than sufficient for most functional prototypes and small batches," says Dr. Oliver Keßling. A further key parameter is the density. The theoretical value for a

dense sphere packing is 74 percent due to the spaces formed between the spheres. With AKF, however, the individual plastic droplets fuse with one another to a greater extent. This results in a density of around 86 percent for e.g. ABS (Terluran GP 35).

### **Rough but even surface**

The differences in surface finish are more significant. "The quality is comparable with that of other high-end additive processes. However, injection moulding is far better in this respect," explains Dr. Oliver Keßling. This is measured using so-called surface roughness testing. "In sample measurements, the mean roughness value  $R_a$  is around 20 microns. To date, we've received very positive feedback regarding component quality. The surface created with ARBURG Plastic Freeforming is always made up of droplets, but it is



extremely even in all directions as macro images show," says Dr. Oliver Keßling. If necessary, there is the option of finishing the parts in a subsequent step.

### **Specification of standard materials**

The salient feature of the freeformer is that it is able to process low-cost standard granulates. In the past, these have been ABS, PA, PC and TPE. "One of the main tasks we've set ourselves is the specification of further plastics and we see the qualification of materials as an important service for freeformer users," emphasises Dr. Oliver Keßling.

### **Production start and further development**

The first freeformers will be delivered to customers in the spring. "Despite the extensive experience that we've already gathered, the freeformer is at the beginning of its possibilities. We now want to exploit these on a step-by-step basis. To this end, the feedback and practical experience from our customers will be incorporated in the further development," says Dr. Oliver Keßling looking forward to the future of the freeformer.

# Total articulation

## Bruder toys: Four-component figures

**T**he smooth, large-volume production of toys requires a high degree of automation in order to produce competitively in Germany – particularly for the international market. Just how this can be achieved with highly complex four-component machine technology from ARBURG is demonstrated by the production of the bworld figures made by Bruder Spielwaren GmbH + Co. KG, based in Fürth, Germany.

The joints of the bworld figures, which are sold worldwide, mean that they can be made to sit, kneel and grip with their hands. This provides a wide range of playing options.

### Flexible, compact machines

The figures are produced on two identical four-component ALLROUNDER 630 S machines with size 100 injection units arranged vertically side-by-side. This means that the compact machines require virtually the same footprint as the single-component versions. On the subject of this technology, Stefan Sellerer, head of the injection moulding shop at Bruder, says: "In the case of the bworld figures, ARBURG was able to provide an extremely detailed machine configuration and expert project support. We also opted for the ALLROUNDERS because we use single, three and four-component moulds from our own mould-making shop on these machines. The high flexibility of the ARBURG machines is ideal for this purpose."

Toy components are produced on a total of 15 hydraulic and electric ALLROUNDERS with clamping forces between 350 and 2,500 kN in Fürth. These also include the two hydraulic four-component ALLROUNDER 630 S and seven electric ALLROUNDER 470 E and 520 E machines.

### Production around the clock

All the machines operate in four shifts, seven days a week. Some of the ALLROUNDERS are equipped with MULTILIFT robotic systems integrated in the SELOGICA machine control system. The bworld figures produced on the

four-component machines are made from a total of six different types of thermoplastic and at least twelve different thermoplastic recipes.

During production, the mould inserts are rotated from station to station via an electric indexing unit for overmoulding with the next respective component. The flexible drive units employed for this purpose can be used for two, three or four-station moulds without the need for mechanical conversions. This means that the machine-related equipment only has to be purchased once rather than several times for each individual mould.

### SELOGICA with comprehensive tasks

For simple production start-up and optimised control during the manufacturing process, several technical features have been integrated into the machine and control system. The external hot runner control system, for example, is connected to the SELOGICA control system via an interface and can be monitored for adherence to the tolerances and release. Further functions such as "boosting", i.e. increasing the hot runner temperature level at



Photo: Bruder

Stefan Sellerer, head of the injection moulding shop at Bruder, is delighted with the technology of the four-component ALLROUNDER 630 S, on which three injection units are arranged vertically side-by-side (photo on left).





the start of production, or lowering the temperature in the event of an alarm or lengthy downtime, can be set directly at the ALLROUNDER. In automation terms, both four-component ALLROUNDERS feature device interfaces for further peripherals, a sorter unit for good and reject parts, as well as actuation and control of the automatic container changer via the SELOGICA control system.

The high-performance machine control system assumes the complete management of all the production sequences. Jürgen Peters from Software Development at ARBURG, explains: "Our SELOGICA supports the complete functionality of up to six injection units, including injection, holding pressure, dosage, decompression and nozzle movements. Each injection unit individually features the complete quality monitoring of all the relevant injection parameters. All these are available via the sequence editor and can be programmed either consecutively or simultaneously, depending on the requirements. This gives our customers the flexibility to freely configure the entire production sequence in line with their needs and the technical moulding conditions. Particularly convenient are also the functions which can

be initiated at the start of production. These include, for example, step-by-step activation of the injection units."

#### Convincing features

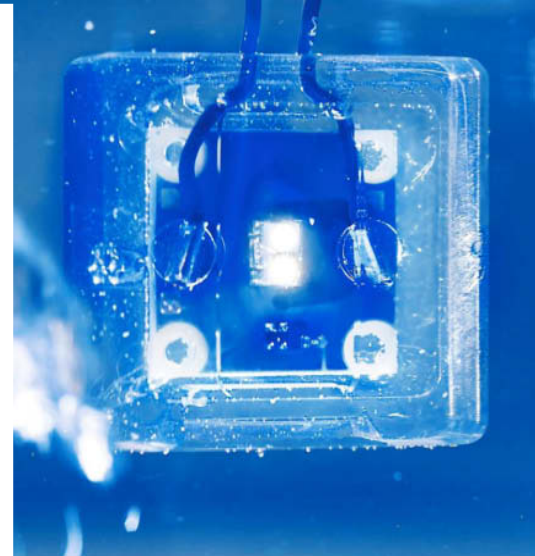
The fact that features of this kind are able to convince even demanding customers is evidenced by the Bruder Spielwaren example. The company purchased its first injection moulding machine from ARBURG back in 1973. "We celebrated the 40-year anniversary of the partnership in 2013," says Stefan Sellerer. "The machine technology is mature and reliable. From a production point-of-view, however, the excellence of the documentation management at ARBURG in all areas also represents an exceptional USP. The support, both on the technical and sales side is also exemplary."

Extremely articulated: the bworld toy figures can adopt a wide variety of positions, providing numerous playing options.

#### INFOBOX



**Founded:** 1926 by Paul Bruder  
**Employees:** Around 380 at the Fürth-Burgfarnbach location  
**Product range:** High-quality 1:16 scale toy vehicles, figures and buildings made from plastic with a high degree of functionality and detail  
**Production area:** Around 10,000 square metres, of which approx. 4,500 square metres of injection moulding production  
**Materials:** ABS, PE, PP, TPE and PC  
**Turnover:** 2013, approx. 68 million euros with an export share of around 70 percent  
**Quality assurance:** Monitoring through independent testing institute and standards for toy safety in the various sales markets  
**Contact:** [www.bruder.de](http://www.bruder.de)



The completely waterproof LED carrier (photo above) is overmoulded with Hotmelt in two steps (photo at bottom).

# Hot stuff

## Hotmelt: Waterproof “packaging” of electronics

**W**hereas polyamide-based hotmelt adhesives were previously used almost exclusively in the field of coating and lamination, there is also an increasing trend for its use in injection moulding. Why? Because moulding hotmelt not only offers tangible advantages, but also because the raw material suppliers have now brought special injectable material types onto the market.

For example, Henkel has developed thermoplastic hotmelt adhesives in its Macromelt product group that can be processed at temperatures between 180°C and 240°C. They are manufactured from sustainable raw materials, do not release any solvents and have a wide application temperature range of -40°C to 140°C. Its adhesion to PA, PBT, PVC and similar polar plastics is also excellent.

### Low pressures, longer cycles

The great advantage of hotmelt in processing is the low internal mould pressures required during injection due to the extremely low melt viscosity of the material. This enables, for example, the overmoulding of sensitive electronic inserts virtually “pressure-free”, i.e. without causing damage to the “inner workings” of the components. Owing to the adhesive properties of the

material, waterproof overmoulding is possible to create robust components with good resistance against media and weathering: ideal for the automotive industry. An important cost factor is that the moulds for processing the material can be produced simply and quickly from aluminium.

### Vertical machines ideal

Vertical machines are usually used for the overmoulding of inserts with hotmelt. In addition to a specially modified screw, a purpose-designed, actively closing non-return screw, an actively closing shut-off nozzle tip and a position-regulated screw are required for hotmelt processing. Monitoring of the mould cavity pressure by the SELOGICA control system ensures the necessary production quality.

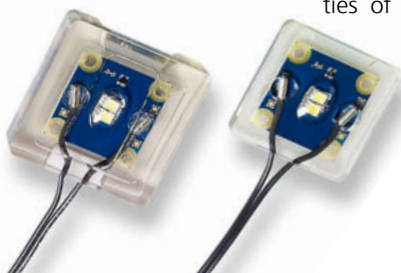
The plasticising unit for hotmelt has a number of special features. A compression-free screw with a low L/D ratio and low injection pressures are used. The non-return valve has been adopted from LSR processing, but has been further modified in order to precisely meet the material property requirements. The shut-off nozzle tip closes actively and opens again at low pressures.

### Simple processing

The parts are produced according to the first-in-first-out principle, ensuring a perfect dwell time in the machine throughout. Due to the rapidly hardening material,

short cycles can be efficiently achieved in comparison to two-component moulding.

The properties of hotmelt and the market-readiness of various hotmelt types suitable for injection moulding have meant that these materials are increasingly being processed using injection moulding. This is particularly the case because the automotive sector represents a customer group which is in search of a third, highly flexible material in addition to TPE and silicone in order to reliably protect sensitive electronics against environmental influences.



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ALLDRIVE

# Efficiency made easy

## Campaign: Energy subsidy in France

**W**hen it comes to energy efficiency, ARBURG plays a pioneering role. The topic has been treated in a comprehensive and global manner and has been enshrined in the corporate philosophy for many years. Low energy requirements and the conservation of resources are important aspects with regard to all developments and investments. The latest example of ARBURG's energy efficiency activities is the current energy-saving campaign in France with energy provider EDF Entreprises as a partner.

The French national energy provider EDF Entreprises will be paying a significant bonus for companies procuring an electric or hybrid injection moulding machine in France.

certificate for injection moulding machines was introduced in October 2013.

Marc Schuh, Managing Director of ARBURG France, played a key role in the initiative and, jointly with the energy experts from EDF, elaborated the conditions for the state subsidy, which injection moulding companies in France will benefit from. The subsidy is available for electric and hybrid ALLROUNDER machines from the ALLDRIVE, EDRIIVE and HIDRIIVE series, all of which bear the ARBURG e<sup>2</sup> energy-efficiency label. The bonus is dependent on the machine type. For an ALLROUNDER 570 A 1600-1300, for example, it can amount to 7,400 euros or more. The subsidy is available at least until 31 December 2014, provided the machine produces in France.

### Further ARBURG incentives

### Bonus for ALLROUNDERS in France

The campaign is based on the CEE energy saving certificate that was set down in law in 2005 with the aim of significantly reducing industrial energy requirement. A special



"In addition to the EDF campaign, we are this year establishing further incentives for investing in electric and hybrid machines," says Marc Schuh: "We will be providing all customers who purchase an EDF-sponsored ALLROUNDER with



ARBURG subsidiary manager Marc Schuh, Marc Gendron (BtoB Services & Partners) and Maxime Dupont (development engineer) (from left) from energy provider EDF Entreprises are delighted to be supporting customers who invest in energy efficient injection moulding machines in 2014.

the preparation for an INTEGRALPICKER or MULTILIFT robotic system free of charge."



# Inner values count

**Precico: Supplier of interiors to high-end brands values ARBURG's**

**W**hen Precico began its cooperation with ARBURG in the late 1990s, no one could have imagined the rapid growth of the new business segment, i.e. the production of plastic parts and pre-assembled modules for vehicle interiors. Precico soon established itself as a supplier of leading global tier 1 and top OEM brands, and achieved rapid growth in the automotive sector.

Precico supports its customers, who are based primarily in Europe, Asia and the USA, as a global system supplier from the conception phase onwards, providing assistance in the design stage through to the series production of the plastic parts, including final testing and assembly of the modules.

After more than 30 years of activities in the entertainment electronics sector, Precico decided to transform itself into a provider of integrated solutions for the automotive sector. Here, the product life cycles are longer than those in entertainment electronics, enabling more balanced production capacity utilisation

and, accordingly, longer-term cost management.

## **Fast growth in the automotive business**

Following the initial years, during which the necessary conditions had to be put into place, the infrastructure built up and the necessary approvals for the automotive business obtained, turnover in the automotive segment quickly grew from 29 percent of the company's turnover in financial year 2009 to 61 percent in 2012.

When Precico entered this sector, ARBURG's many years of experience in the automotive industry proved highly beneficial. Gooi Soon Hock, Precico's Managing Director, says: "For newcomers, this industry always provides a huge challenge. The support from ARBURG is one of the main reasons why we succeeded in making a comparatively swift breakthrough."

## **More than half ALLROUNDERS**

Precico's injection moulding machine fleet currently consists of

around 100 machines at two production locations, including 59 ALLROUNDERS. The total floorspace available for injection moulding applications is around 14,000 square metres. As machines with a "good price/performance ratio", the hydraulic ALLROUNDER C and S models are used for parts with lengthy cycle times. The hybrid ALLROUNDER H machines are seen to offer the advantage of low energy requirements and a higher injection speed, as well as longer tie bars and are used for small parts which require a large mould. Where possible, all machines are equipped with robotic systems for part removal.

For the production of around 40 per cent of the products, Precico uses machines featuring complex hydraulic core pull systems as well as multi-component and MuCell technology. These include, for example, complex pushbutton caps or decorative trims. Here, ARBURG impressed with its tailored application technology advice and support.

## **High flexibility is key**

The company particularly appreciates the flexibility of the





Precico produces sophisticated products such as switches and shift levers (top and bottom photos) on ALLROUNDER machines (centre photo).

## automotive expertise



Photos: Precico

processing sequences provided by the ARBURG machines. One example are the hydraulic core pull systems which operate on a "time-controlled" basis over three sequences, to guarantee smooth functioning of the slides. The flexibility for perfect integration of such systems into the production process via the SELOGICA control system is an important advantage offered by ARBURG, explains Gooi Soon Hock.

When asked how he envisages the future collaboration with ARBURG, he sums up as follows: "We regard ARBURG as a company which, as one of the market leaders in injection moulding technology, is continuously investing and growing.

We can therefore expect ARBURG to continue offering innovative systems and solutions for our challenging market. We definitely need and value this strength."

### INFOBOX

**Founded:** 1979 by Gooi Soon Hock

**Location:** Penang, Malaysia

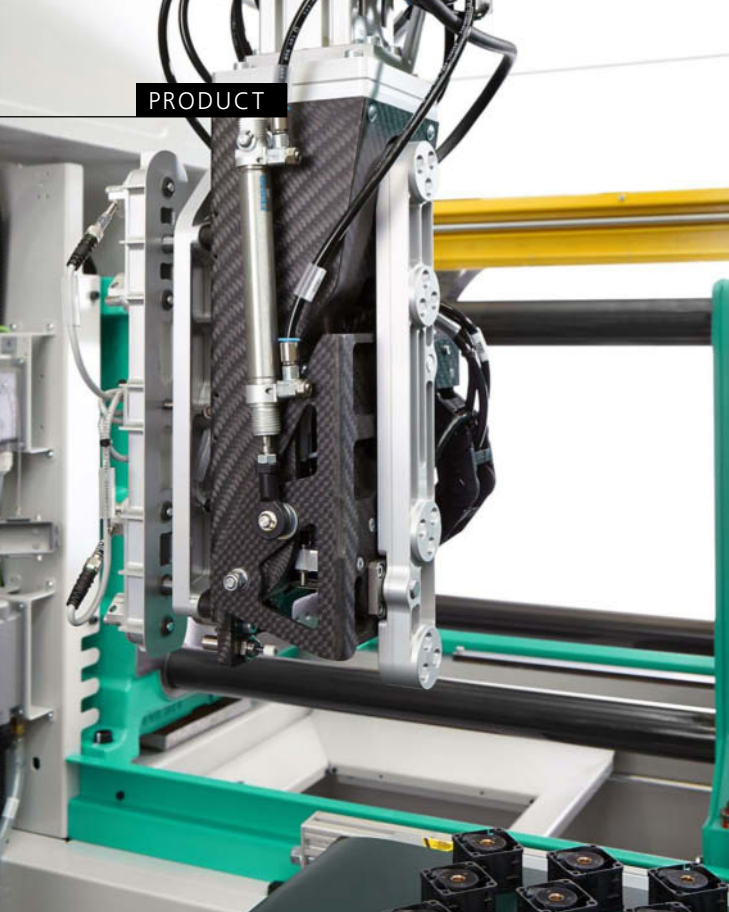
**Employees:** 1,600

**Turnover:** 147.5 million MYR (approx. 33 million euros in 2013 (nine months))

**Machine fleet:** Around 100 injection moulding machines, of which 59 ALLROUNDERS

**Products:** Plastic parts and assemblies for vehicle interiors, including individual parts, components and assembled modules such as switches, shift levers and centre consoles, as well as complete finished products for simpler shipping to a European OEM customer

**Contact:** [www.frenckengroup.com](http://www.frenckengroup.com)



# Lightweight, compact, fast

## Carbon fibre: New lightweight automation technology

**C**omplex structures and nested lifting axes make the carbon gripper lightweight, compact and fast. The new technology offers additional functionality, as well as increasing production efficiency. The comparatively low additional costs quickly pay off because robotic systems with lower load-bearing capacities or smaller injection moulding machines can be used.

“With the new gripper made from lightweight and sturdy carbon fibre, we are extending our scope for customer-specific automation solutions,” explains Oliver Giesen, Department Manager Projects at ARBURG. “The carbon gripper is suitable for numerous different applications with our linear and six-axis robotic systems. Thanks to the significant weight reduction with regard to the gripper, for example, a MULTILIFT with a load bearing capacity of 6 instead of 15 kilograms, which is more cost-effective and requires less en-

ergy than the larger model, can be used. The additional cost of around five to ten percent compared to the conventional gripper are then soon recouped.”

### Scope for additional functionality

The main components made from carbon fibre are the basic body, supporting elements and the two hinged lifting axes. These are slightly cantilevered and nested in one another. This makes the gripper extremely compact, providing more space for functional elements. The two axes fold out horizontally, one in order to pick up the inserts and the other to set down the finished parts. An additional function offered by the carbon gripper is a stripper movement for transferring the inserts into the mould. Owing to its extremely compact design, the mould does not have to open as wide. This results in a shorter cycle time. In some cases, the use of smaller injection moulding machines is even possible.

Carbon fibre makes the new gripper robust yet lightweight. Its folding axes are compactly and vertically positioned in the mould, (photo on left). These can be folded out horizontally in order to pick up inserts and set down finished parts (photo on right).

“Under favourable circumstances, a slight additional capital investment can therefore open up huge potential for enhancing production efficiency. We therefore always recommend an individual examination on a case-by-case basis,” explains Oliver Giesen regarding the advantages of the new gripper technology.

With the MULTILIFT SELECT 6+1, the primary arm removes the moulded parts (right) and the secondary arm, the sprues (left).



# Double access

## MULTILIFT SELECT 6+1: Ideal solution for three-platen moulds

**T**he various international standards for mould construction still differ in terms of the technology employed. In Asia, for example, many of the moulds used operate with so-called three-platen technology. For this market, the ARBURG range includes the vertically operating MULTILIFT SELECT 6+1 robotic system.

In the case of three-platen moulds, the moulded part and sprue can be easily separated. Here, the sprue system is located in a second parting line so that it is demoulded with the "mould opening" movement.

### Widely used in Asia

While three-platen moulds have been largely displaced by hot-runner technology in Europe and North America, many companies, particularly in the Asian region, still work with this kind of mould. For these injection moulding companies, the ARBURG range has included the MULTILIFT SELECT 6+1 since 2013.

This dual-arm robotic system featuring five servo-electric axes is available for all hydraulic, hybrid and electric ALLROUNDERS in the machine sizes from 270 to 570. The primary arm of the robotic system is equipped with three servo-electric main axes as well as one or two pneumatically driven rotary axes in the gripper area. The secondary arm performs movements via two further servo axes in order to remove the sprues separately.

### Highly precise machine movements

The servo drives of the MULTILIFT SELECT 6+1 provide for maximum acceleration, high repeat accuracy as well as reproducible sequences and thus represent a production-efficient solution for pick-and-place or stacking operations. Fully simultaneous movements are possible on all axes, shortening mould intervention times.

The pneumatic B (optional) and C axis can each be swivelled through 90 degrees. This robotic system is suitable for handling a maximum weight of six kilograms

(part weight plus gripper, plus secondary B and/or C auxiliary axes), plus a maximum sprue weight of one kilogram. This explains how the designation "6+1" for the MULTILIFT SELECT was coined.

### Integrated in SELOGICA

The entire production sequence is programmed via the SELOGICA control system. With the user-friendly teach-in function, all the setting procedures are easy to manage. The robotic system data record is integrated into the record for the injection moulding machine, eliminating the risk of data loss.



# 30,000 square metr

**Hongrita: Chinese specialist for LSR and multi-component proces**

**L**ike many Chinese companies, Hongrita has undergone a breath-taking development. Twenty-five years after its foundation in 1988, it currently employs a staff of 1,100 at its headquarters in Hong Kong and production location in Shenzhen, which covers an area of around 30,000 square metres. Points of contact with ARBURG are primarily in the areas of multi-component injection moulding and the processing of liquid silicone (LSR).

Hongrita mainly focuses on the automotive, medical, packaging, electronic and white goods sectors as well as the European, Asian and North American markets.

## Dynamic growth

The market for LSR and multi-component applications is growing, particularly in China, but also in Europe and America. Hongrita exported 48.5 percent of its overall production to Europe last year and 38.5 percent to Asia. This makes these two regions the company's most impor-

tant sales markets. As a system supplier, Hongrita is able to provide all manufacturing and service components from parts development onwards. Impressive product examples include a magnifying glass and scissors produced using the three-component process in a single step.

## Orange peeler made from PC and LSR

An interesting two-component application is the orange peeler, whose LSR components are pleasant to the touch and ensure comfortable use. The production of this hard/soft combination using a 4+4-cavity mould was demonstrated at the Chinaplas 2013. An ALLROUNDER 520 S with a clamping force of 1,600 kN and two, size 290 and 100 injection units (vertical) were employed. The cycle time is around 45 seconds. The sequence is as follows: the first step is the introduction of the "hard" PC into the mould.



Photos: Hongrita

The mould core then is rotated, the "soft" LSR material injected horizontally and the orange peeler completed.

In configuring the mould, the most challenging task was the perfect combination and precise separation of the hot and cold runner systems. This is important due to the large differences in mould temperature for the PC (80°C) and LSR (220°C) components. The same applies to the material temperatures in the cylinder modules. These are around 300°C for the PC and from 20 to 30°C for the LSR component.





At the Chinaplas 2013, a sophisticated two-component application was presented in the form of an orange peeler as a hard/soft combination. Three-component parts such as the magnifying glass or scissors (photos at bottom) demonstrate Hongrita's competence in multi-component injection moulding. Hongrita also operates a clean room (centre photo) for the production of LSR parts.

# es of high-tech

## ing

### Co-operation since 2010

The first contact came about in 2010 in the form of a visit from Hongrita to Lossburg on the occasion of the ARBURG Technology Days. Today, Hongrita produces with a total of 29 hydraulic ALLROUNDERS with clamping forces from 500 to 2,500 kN, including four multi-component ALLROUNDERS. The three-component machine features an LSR injection unit. Conventional two-component parts are made from thermoplastics on two 2-component ALLROUNDERS, while the fourth machine features two LSR injection units.

### Entry into LSR field with ARBURG

Hongrita only entered into LSR processing some two years ago. As a pioneer in this field, ARBURG provided valuable assistance in setting up efficient LSR production. Moreover, the company set up a special LSR team.

In late 2013, the cooperation even entered into the clean-room field with the purchase of five further ALLROUNDERS. Here, a total of nine ARBURG machines will produce moulded parts, mainly from LSR.

### Common values as a basis

What Hongrita particularly appreciates about ARBURG are the values that the two companies share, such as professionalism and comprehensive consulting, as well as pre- and after-sales service. The ALLROUNDERS impress particularly by virtue of their reliability, precision, reproducibility and short cycle times. A further key feature is the open, flexible and user-friendly SELOGICA control system for monitoring the production process and the function for monitoring maintenance intervals. Felix Choi, Managing Director of Hongrita, says: "At ARBURG, a well-founded support service accompanies optimum machine technology. For us, ARBURG is a partner for complete solutions."

### INFOBOX

**Founded:** 1988 by Felix Choi, recipient of the Young Industrial Award of Hong Kong 2012

**Production:** 24 hours, 7 days

**Turnover:** 40 million USD (around 29.6 million euros) in 2012

**Materials:** Thermoplastics and LSR, individually and in combination

**Machine fleet:** 29 ALLROUNDERS

**Certification:** ISO 9001, ISO 14001, VDA 6.4, TS 16949

**Contact:** [www.hongrita.com](http://www.hongrita.com)





## TECH TALK

Oliver Schäfer, Technical Information



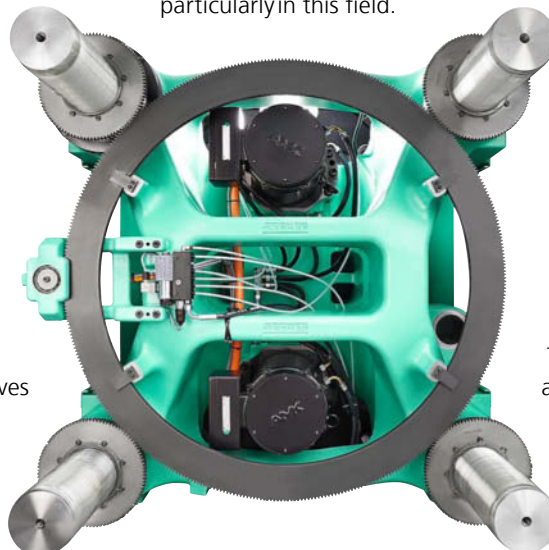
# Powerful interaction

## Combination of several electric drives ensures high power

**D**uring development and production, ARBURG has always placed great value on the modularity of its components. Important advantages such as a high level of customisation and adaptation to the existing requirements continue to justify this approach. It is also one that the company has adopted with regard to its electric drives. Why? Because here too, these advantages, combined with the high level of in-house production, result in ideal solutions to the benefit of the customers.

The limits of electric drives are defined by the sheer size of the motors. A simple equation states that to achieve higher power, a larger motor is required. Unless, of course, a modular alternative is used that achieves the necessary power by simultaneously using several smaller motors. This trend is currently evident,

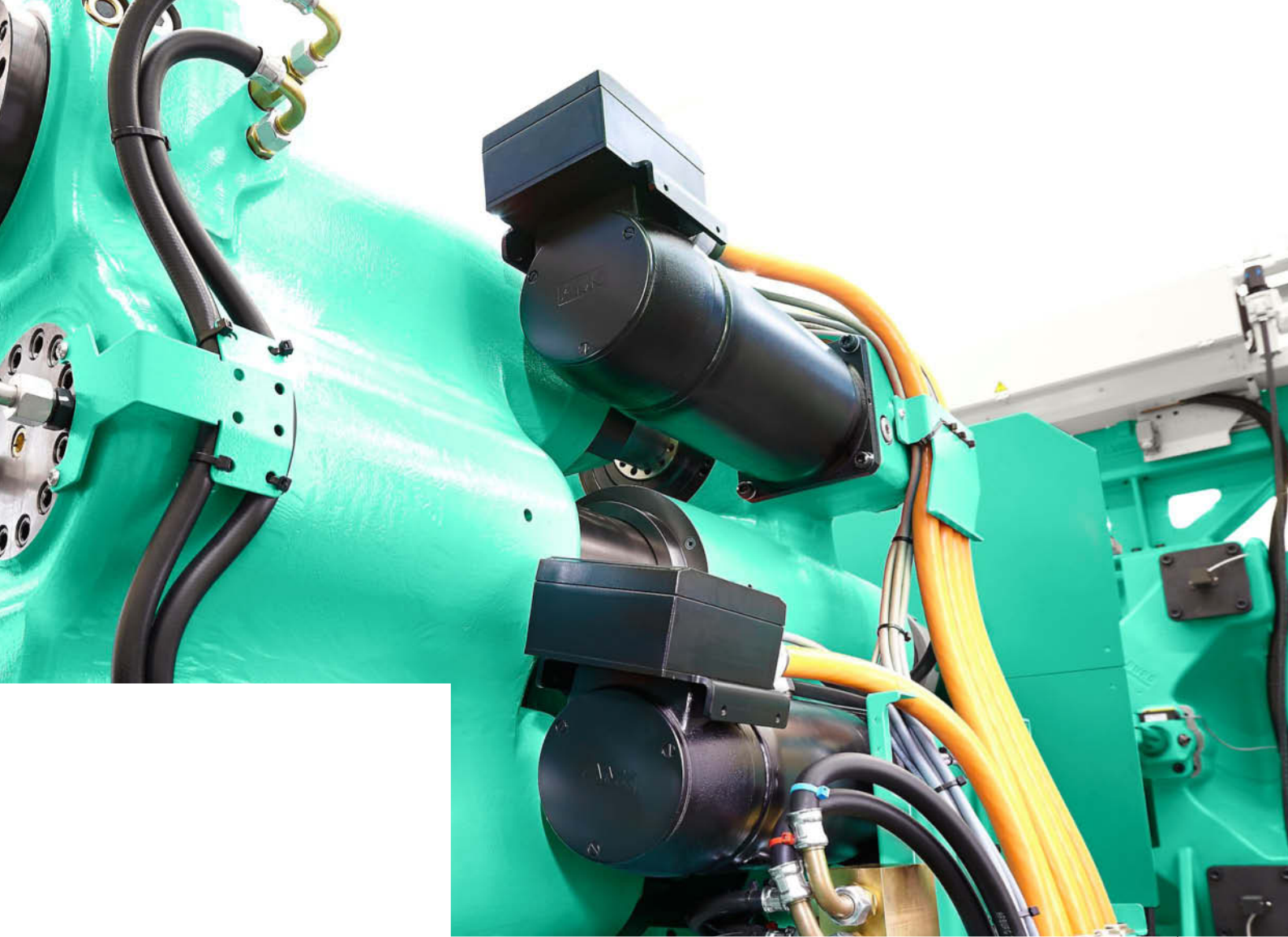
for example, in the automotive industry. While a central electric drive motor is often used, some high-end vehicle manufacturers are already employing several additional decentralised electric drives at two or all four wheels. This not only enables the use of smaller motors, but some components, such as the drive train, can be dispensed with. This ensures more space and less weight. Important criteria, particularly in this field.



### Synchronisation of electric drives forms the basis

Where high power is required, as with the electric toggle-type clamping units above 4,000 kN, ARBURG also relies on a modular drive concept. In concrete terms, this means

- that several smaller servomotors are synchronised.
  - The complete systems consist of proven, standardised individual components.
- In conjunction with a high level of in-house production, compact drive modules that can be much more easily integrated into the overall machine layout are created. A current example is the new electric 2100 injection unit. Here, a total of four servo motors and spindle systems adopted from the smaller size 290 injection unit are used. These are therefore proven components which have been frequently used in the past. This re-



sults not only in cost benefits, but also in a high level of operational reliability and rapid spare parts supply.

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#### **In-house production extends even further**

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Modularity requires holistic thinking and actions. This is why ARBURG produces the main drive components, such as planetary roller screw drives, in-house. Technically, these spindle systems are extremely challenging to produce, but they offer significant advantages compared to more simple systems. Due to their comparatively large contact surface, they are low-wear to operate and highly precise over long operating periods. Here again, it soon becomes clear: the in-house development and production of key modular components requires a high level of in-house expertise, but provides numerous advantages in terms of technology and support.

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#### **Modular in-house production is key**

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But modularity doesn't just come about by itself. The fact is that modular in-house production must be well-conceived, stringently set up and consistently implemented in order to represent a successful model. A modular approach based on standardised individual components achieves significant benefits for the manufacturer and customer alike thanks to low production costs due to series of identical designs as well as flexibility of products and offerings thanks to greater adaptability.

ARBURG consequently endeavours to keep the level of in-house production high and to extend it in a targeted manner for key components, in order to adapt the technology to specific injection moulding requirements and continue to consistently meet high quality standards. Cost and delivery efficiency for the customer as well as the long-term availability of spare parts are further important advantages. It is thus the combination of modularity and in-house

In the case of large injection units (photo above) and large clamping units (bottom photo) the combination of several electric drives achieves the necessary power.

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production which is best suited for responding flexibly to the specific injection moulding company requirements, both today and in the future.



**Precision counts!** Tolerances of 0.01 mm and lower – in high-volume production. Impressive, isn't it? Precise and delicate: this is only achievable with leading, cost-effective injection moulding technology. But you're already familiar with this level of production efficiency from us. ARBURG for efficient injection moulding!



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