

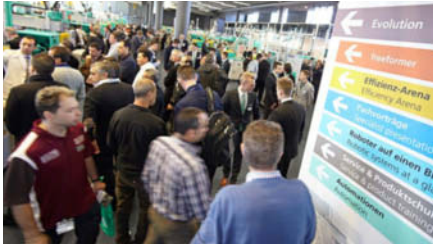
# today

The ARBURG magazine

Issue 60

2016





**4 Technology Days 2016:** A wealth of highlights and innovations

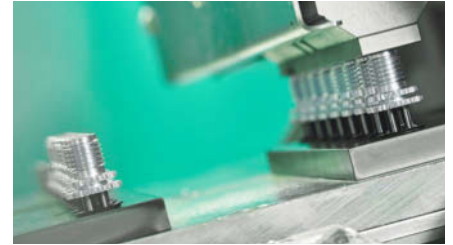
**5 Industry 4.0:** Exploiting opportunities at an early stage

**6 Ecco:** Injection moulding of TPU shoe soles ensures quality and doubles output



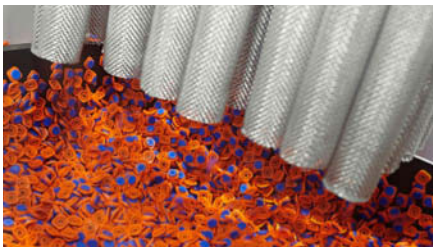
**8 Poly-Nister-Plastik:** Vertical machine produces functional part for Miele vacuum cleaner

**10 Jordan Daykin:** Inventor makes Gript fixing elements a global best-seller



**12 Wilhelm Plastic:** Integration of manual steps enables a low-cost solution

**14 Veaser:** Two-component pump housing for dishwashers



**16 Trelleborg Sealing Solutions:** Adapted material mix and expertise for LSR-LSR combinations

**18 INTEGRALPICKER V:** External controller makes for greater independence

**19 freeformer:** Driving forward with a practical approach to development



**20 igus:** freeformer processes the company's own high-performance plastics

**22 Construcciones Grávalos:** High-tech production and expertise in specialties



**24 Bond-Laminates:** Tepex® thermo-plastic composite sheets for high-strength, lightweight composite components

**26 TECH-TALK:** Making the complex simple - preparing the way for Industry 4.0

## IMPRESSUM

today, the ARBURG magazine, issue 60/2016

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**Responsible:** Dr. Christoph Schumacher

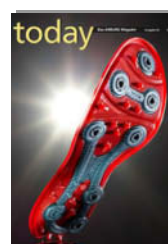
**Editorial advisory committee:** Heinz Gaub, Oliver Giesen, Juliane Hehl, Martin Hoyer, Jürgen Peters, Bernd Schmid, Jürgen Schray, Wolfgang Umbrecht, Dr. Thomas Walther, Renate Würth

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

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

**Tel.:** +49 (0) 7446 33-3149, **Fax:** +49 (0) 7446 33-3413

**E-Mail:** today\_kundenmagazin@arburg.com, www.arburg.com



Ecco relies entirely on ARBURG technology for the injection moulding of its TPU soles for its high quality shoes. Output has been doubled, thanks to the ALLROUNDER injection moulding machines with MULTILIFT robot systems.

**ARBURG**



Dear readers,

Perhaps you are surprised to receive the new issue of "today" so early in the year? We have purposely brought the publication date forward

so that, among other things, we can offer you a preview of the Technology Days 2016 in plenty of time before the actual event. Perhaps what you read here may inspire some of you to pay a visit to our international industry event in Lossburg. We guarantee it will be worthwhile: even though the K international trade fair will also take place this year, we have put together an ambitious programme for the Technology Days, with plenty of highlights and surprises in store. We will announce another surprise regarding "today" in just a few weeks' time. This is certainly something to look forward to!

You will find the reports in this issue equally exciting, as we look at different aspects of successful companies. For example, you will admire the courage of young

inventor Jordan Daykin, who, at the tender age of 13, not only had a fantastic product idea, but actually succeeded in producing and marketing it.

This issue will also explain how plastic parts with functional integration make our daily lives more pleasant and how a shoe manufacturer has managed to conquer the challenges of fast-changing model designs with the automated injection moulding of soles.

We also take a look to the future with an account of the developments with ARBURG Plastic Freeforming and the potential of two-component silicon applications and thermoplastic composite sheets.

I hope you enjoy reading our new issue.

Renate Keinath  
Managing Partner & Managing Director





# Worth your while!

## Technology Days 2016: A wealth of highlights and innovations

**T**he Technology Days are almost upon us. ARBURG once again expects to welcome several thousand trade visitors from all over the world to this unique event, to be held from 16 to 19 March 2016. Our international guests can look forward to a varied programme with a wealth of highlights and innovations.

Naturally, the motto for the Technology Days 2016 is production efficiency. The over 40 exhibits and applications will cover the entire range of ALLROUNDER sizes and drive variants, as well as all industries and processes. ARBURG Plastic Freeforming with the freeformer will also be demonstrated.

### Industry 4.0 in theory and practice

In the efficiency arena, which this year bears the name "Industrie 4.0 powered by Arburg", ARBURG, together with a number of selected partners, is presenting various aspects of Industry 4.0. Exhibits will include an automated and fully digitally integrated production set-up and a combination of injection moulding and additive

manufacturing for individualised products. The focus is on the ARBURG host computer system as a central element for the implementation of Industry 4.0.

### Experts present the latest trends

In addition, the subject will also receive further investigation in the expert presentations, held in both German and English. Furthermore, a team of experts will be on hand to explain the latest trends and processes in lightweight construction and developments in ARBURG Plastic Freeforming.

The new assembly hall is another highlight that awaits visitors to the Technology Days 2016 event. This two-story building covers around 18,600 square metres and is where large ALLROUNDERS and turnkey systems are assembled and commissioned.

### Presentation of the automation range

ARBURG is showing its entire automation spectrum there: this ranges from the new retrofittable INTEGRALPICKER V with its own controller (see page 18) to complex turnkey solutions. Visitors will

Every year, the broadly-based agenda of the Technology Days can be relied upon to impress international trade visitors.



have the opportunity to find out about the new hall by taking a guided tour.

The service area will be presented with a range of practical examples of preventive maintenance, rounding off the Technology Days 2016 programme.



Information  
News



Automation  
 Transparency  
 Networking  
 Smart Factory  
 Efficiency  
 Production  
 Products  
**Industry 4.0**

# What should I do?

## Industry 4.0: Exploiting opportunities at an early stage

**T**hese days everyone is talking about “Industry 4.0”, however, many people are wondering what this means for their own companies in specific terms. The overriding goal for all commercial activities is always to secure and extend competitiveness. That’s why it is so important to consider the integration of production and IT technology in good time.

The prerequisite for a smart factory in line with Industry 4.0 principles is the strict integration of machines, order information and process data by means of a continuous and transparent communication system. ARBURG has already been following this path for many decades in its own production. As a pilot company for the “Industry 4.0 Guidelines” published by the VDMA, the professional association representing Germany’s machinery and plant manufacturing businesses, it has gathered a great deal of valuable experience.

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### Every company is different

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The key to the successful implementation of Industry 4.0 is that the issue must

go right to the top and requires the support of the entire management team. The interdisciplinary cooperation of all corporate areas is also of key importance in bringing together all expertise. Because every company needs its own approach, the first step is to determine one’s own situation and to analyse the available skills.

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### Focusing on production and products

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It is necessary to consider both production and products in detail. The aim of production is to improve the processes, making them more transparent, e.g. through the use of a host computer system. This results in an increase in production efficiency and, in the final analysis, a reduction in product costs. The aim in relation to products is to increase their added value, e.g. through the direct inclusion of individual customer requirements in the production process. This can be achieved by further developing existing products and coming up with new products.

When it comes to the development of new ideas and business models it is important not to try to do everything at once, but rather to set priorities in line with the

existing market potential and available resources and to bring these to fruition in a step-by-step approach.

A number of companies have already started moving towards Industry 4.0, e.g. through flexible automation, interactive maintenance planning, self-organised logistics or batch-based data archiving. There are also products that are already clearly identifiable and that can be located at any time, as they record their own history and current status and control their manufacture for themselves.

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### Securing long-term advantage

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It is important to exploit the opportunities offered by Industry 4.0 as early as possible in order to secure and extend a company’s competitiveness.



# It's the profile that

## Ecco: Injection moulding of TPU shoe soles ensures quality and

**S**hoes from Ecco enjoy a world-wide reputation for comfort and quality. The Danish family-run company places its faith in the highest standards and its own added value, from design, development and production to sales in its own chain of shops. When it comes to the injection moulding of soles from TPU (thermo-plastic polyurethane), Ecco relies on a partner with equally high standards: ARBURG. This has enabled it to double its output.

Cooperation with ARBURG started strategically with Ecco's entry into high-volume production of TPU soles in 2013 in Slovakia.

### 100 percent ALLROUNDER

The injection moulding process is used, because it combines higher sole quality with a larger degree of design freedom.

The Ecco production locations in China, Thailand, Slovakia and Portugal produce TPU soles using mainly classic single-component injection moulding. Multi-coloured soles are created through different-coloured inserts or using two-component injection moulding. Furthermore, textiles, leather, foils and printed parts are overmoulded with TPU. All injection moulding machines are ALLROUNDERS and the majority work with MULTILIFT systems and have vacuum as well as injection compression equipment.



### Automation brings advances

Jochen Maerlaender, Global Senior Technical Manager (TPU) at Ecco, describes the company's requirements: "Those who wish to establish a truly competitive sole production operation are dependent on a high degree of automation, both regionally and internationally. This is the only way to ensure the targeted quality level and cost savings that are achievable in the production of such components, even in Europe. The processing of the very soft TPU materials with Shore hardness levels between 46A and 95A (soft rubber) requires careful treatment in conjunction with the relevant injection parameters, as well as perfect drying. In addition, the soft moulded parts are difficult to remove. Another challenge is the large number of injection moulds required in order to be able to produce all shoe sizes and models. Of great importance here, is a very high level of standardisation combined with fast product changes due to fashion influences."

### The versatile 2-component ALLROUNDER

On the large ALLROUNDER 920 S two-component machines, Ecco mounts two-colour moulds and two standard moulds adjacent to one another and can therefore produce two pairs of soles simultaneously. "In these production processes, we see the fast change of our standard moulds as the greatest advantage of the ALLROUNDERS," emphasises Jochen Maerlaender. "Because we use aluminium moulds due to the quick processing options, cost advantages and shorter cycle times they offer, we require high-precision injection moulding



Photos: ecco

machines in order to bring the life cycles of the moulds in line with those of the products, at a consistently high level of quality. Thanks to the very high level of standardisation, we can manufacture a

### INFOBOX

**Name:** Ecco Sko A/S

**Founded:** 1963

**Products:** Comfortable, design-oriented shoe and bag collections with a high level of in-house production

**Employees:** 19,800 throughout the world

**Production:** Five locations in China, Indonesia, Portugal, Slovakia and Thailand

**Machine fleet:** 17 ALLROUNDERS with clamping forces from 2,000 to 5,000 kN

**Contact:** www.ecco.com

# counts

## doubles output

Ecco produces shoe soles (photo right) using both single-component and two-component injection moulding processes. Two standard moulds are also used on the large two-component ALLROUNDERS, enabling two pairs of soles to be produced simultaneously from one component in each cycle (photo left).

production-ready mould without errors within three days. We have practically no time window for corrections, as we have to finish our collection in good time for each season."

He identifies other benefits of the ALLROUNDER and MULTILIFT robotic systems as the joint programming using the SELOGICA machine controller and the backup of these parameters via a common data set that can be interchanged between machines.

### High quality, twice the output

"Both of these factors have enabled us to increase our production efficiency. Productivity has almost doubled compared with conventional manual sole production, as is often the case in Asia, for example, without having to compromise regarding our quality and efficiency requirements," reports Jochen Aerlaender proudly, pointing the way to the future: "The development is clearly towards further automation. For this we need partners we can rely on completely - like ARBURG."







# Precise insertion

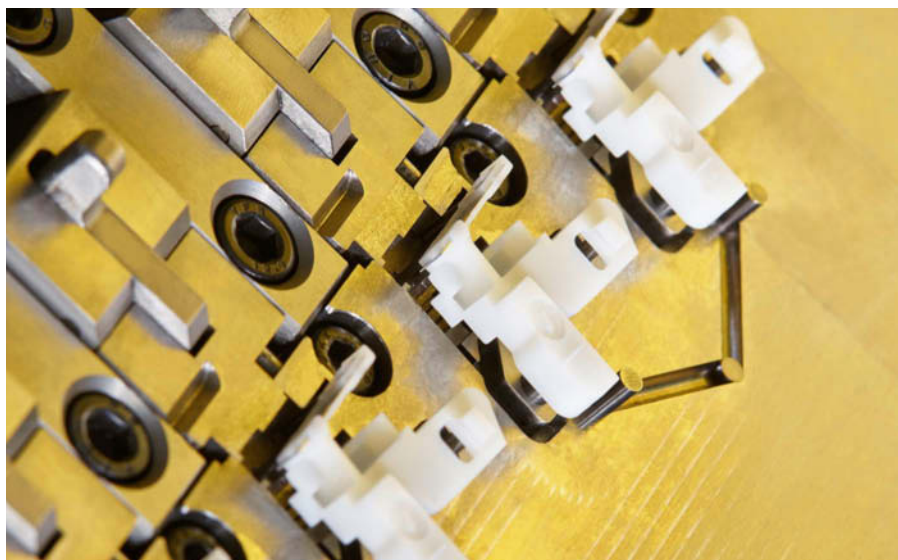
**Poly-Nister-Plastik: Vertical machine produces functional part for**

**G**erman family-run company Poly-Nister-Plastik has been producing high-quality plastic products for almost five decades. The company specialises in overmoulding inserts. These include retaining pawls for the cable drums of Miele vacuum cleaners. Although it looks simple at first glance, the product is extremely complex to manufacture. A vertical ALLROUNDER 375 V produces the retaining pawls in large numbers using ingenious mould, control and insertion technology.

When you've done vacuuming, quickly rewind the connecting cable automatically and stow the machine in the broom cupboard. These days we all take it for granted that a press of a button will be enough to conveniently trigger a retaining pawl, causing the cable to rewind automatically.

## One million retaining pawls per year

Poly-Nister-Plastik GmbH & Co. KG knows what lies behind this: each year the company produces around one million retaining pawls for Miele vacuum cleaners at its location in Westerwald, Germany. "At the heart of the retaining pawl is a pre-tightened leaf spring, which we overmould with POM," explains Matthias Schumann, Head of Technology at Poly-Nister-Plastik. "When choosing a suitable



injection moulding machine we focused on fully-developed, absolutely reliable technology. In this context, it was important to us that the functions of the complex PLC-monitored mould should be incorporated in the machine's controller and that there should be a large rotary table for overmoulding the delicate inserts." The choice finally fell on a vertical ALLROUNDER 375 V with a clamping force of 500 kN and a size 100 injection unit.

The first challenge in the production process is the handling of the leaf springs, which are only 0.2 millimetres in thickness. These parts are simply impossible for a robot to pick up. However, this task can be handled very effectively in cooperation

between man and machine: the springs are aligned on a magnetic mould platen and are then inserted into the cavities by an operator.

## Pre-tightened springs in the mould

Inside the mould, the springs are pre-tightened to a defined state by mechanically activated slides. The necessary slide movements and positions are monitored by proximity switches together with a programmable logic controller (PLC). To ensure smooth communication between the SELOGICA machine controller and the external PLC, the ALLROUNDER is fitted with programmable inputs.





Photos: Miele

## Miele vacuum cleaners



Retaining pawls enable the electric cables on Miele vacuum cleaners to retract automatically (photo above). The delicate springs are aligned on a magnetic mould platen (photo right) in the mould (photo left), placed under a defined tension by means of mechanically actuated sliders and overmoulded in a cycle time of round 45 seconds to produce the finished retaining pawl (photo centre).

Production manager Joachim Orsowa is also very impressed with the position-regulated screw. This ensures a high level of precision and part quality when overmoulding the inserts. This is despite the fact that the entire shot volume is only around ten grams; a finished part weighs around one gram.

### Position regulation for precision overmoulding

The screw position is precisely regulated during injection moulding, so that the reproducible filling of the cavities is assured even if minor variations occur in the viscosity of the material, so that constant part dimensions are assured. Injection and holding pressure behaviour are similar to that of the electric machines.

After a cycle time of around 45 seconds, the table of the ALLROUNDER 375 V

turns by 180 degrees. "ARBURG demonstrated extensive expertise in supporting us as we introduced this application," says Matthias Schumann, praising the collaboration with the injection moulding experts. "The system runs very reliably in a multi-shift operation, enabling us to produce millions of retaining pawls with maximum reliability."

### INFOBOX



**Name:** Poly-Nister-Plastik GmbH & Co. KG  
**Founded:** 1967 by Hans-Wilhelm Damm; in 2012 his daughter Katja Rattay took over at the head of the company  
**Location:** Westerwald, Germany  
**Turnover:** 5.6 million euros (2014)  
**Production area:** 1,600 square metres  
**Employees:** approx. 70  
**Industries:** Domestic appliances and the electrical industry, automobiles, plumbing, mechanical engineering  
**Machine fleet:** 32 machines with clamping forces from 220 to 2,900 kN  
**Contact:** [www.polynisterplastik.de](http://www.polynisterplastik.de)





# Fabulous success story

## Jordan Daykin: Inventor makes Griplt fixing elements a global best-seller

**T**here was once a 13-year old boy who moved in with his grandfather and attempted to hang up a curtain in his new room. But the nail failed to hold on the plasterboard wall. So he invented a better solution and had it patented in 2009. Five years later, he formulated a business plan and, as a 19-year old and youngest ever participant in the popular BBC television show "Dragon's Den", won £ 80,000 some of which he invested in ALLROUNDER injection moulding machines.

In October 2015, the young British entrepreneur, together with his company, Griplt Fixings and ARBURG Ltd. in Warwick, UK, won the prestigious Plastics Industry Award in the "Supplier Partnership – Prime Machinery" category.

### One million parts each month

Since then, "Griplt" fixing elements have become best-sellers and are available in more than 2,500 DIY stores in Great Britain. With a team of twelve employees, the company currently produces almost one million parts each month on four ALLROUNDERS at its Melksham factory in Wiltshire. "As soon as I received the patent in 2012, I sent out thousands of product samples to hardware shops and DIY stores. Four days later I received the first call from a large DIY chain and in February 2013 we got an order for 25,000 fixing elements.

This is what prompted me to move into mass production," says Jordan Daykin, looking back on the early days of his injection moulding line.

### ARBURG – the perfect technology partner

He chose ARBURG because of its good reputation in the market, the high quality of its machines and its enormous expertise. "I met Colin Tirel, the Managing Director of ARBURG Ltd., in summer 2014, at the time when the TV show was being broadcast. I was really impressed that he understood exactly what I needed. ARBURG is the perfect technology partner from my point of view." In one or two years, Jordan Daykin aims to have quadrupled the number of ALLROUNDERS and to have achieved a turnover of £ 4 million (EUR 5.7 million). His goal is to bring six new products to market and to have his products on the shelves of over 10,000 shops worldwide - a target that is to be achieved through expansion into Australia and the US. However, Jordan Daykin isn't all about growth and profits, which is why he is happy to share some of his success. For example, he advises start-ups and young entrepreneurs. Even though he left school at 13, he knows the importance of finding a good tutor. That is the point of the "Tutor Magnet" online service, which is aimed at individuals who need additional private mentoring on key subjects.



Photos: Griplt Fixings

Jordan Daykin (photo left) is the inventor of "Griplt", a fixing element for plasterboard walls (photo above).

### INFOBOX



**Name:** Griplt Fixings  
**Founded:** 2012  
**Location:** Melksham, Wiltshire, United Kingdom  
**Products:** Fixing elements for plasterboard walls  
**Employees:** 12  
**Machine fleet:** Four ALLROUNDERS  
**Contact:** <http://griplitfixings.co.uk>

# Perfect combination

## Wilhelm Plastic: Integration of manual steps enables a low-cost

**E**conomic efficiency during parts manufacture and during procurement were equally important requirements when it came to the development of a turnkey system for Wilhelm Plastic. The concept was put into practice in a "cost efficient" way by linking upstream manual process steps using an individual automation concept from ARBURG that was tailored to the specific task in collaboration with the customer.

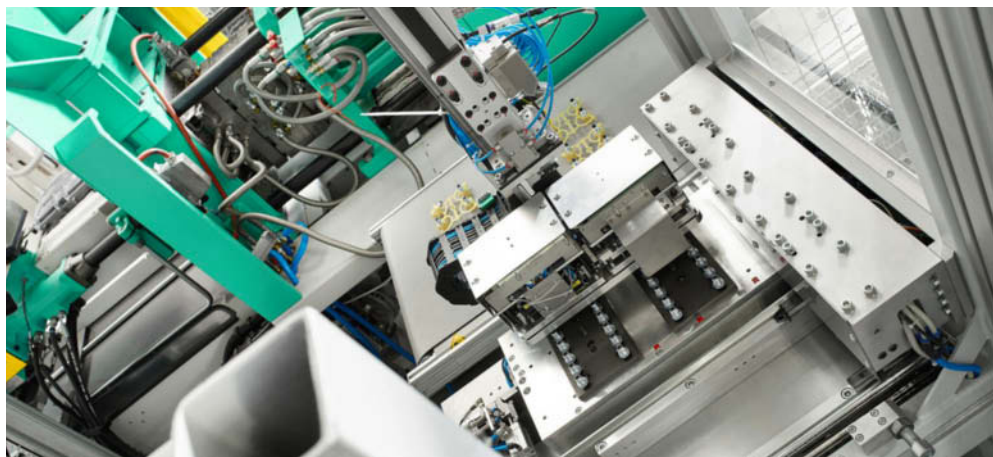
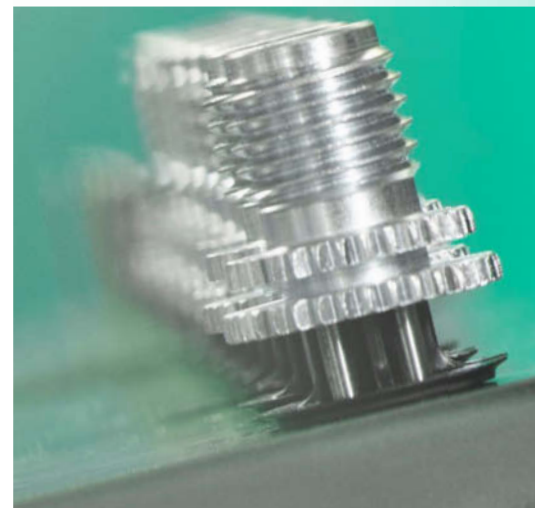
Wilhelm Plastic GmbH & Co. KG in Floh-Seligenthal, Germany, has been an exclusive ARBURG customer for two generations and has already equipped around half of its ALLROUNDERS with robotic systems.

### Improving productivity and quality

In the case of threaded flanges, a turnkey system was the obvious next step, according to managing director, Jana Pfannstiel: "For more than a year we placed the parts for overmoulding in the mould by hand. However, because demand doubled within the same period, we inevitably needed to automate the production process. In addition, we wanted to harmonise the process by introducing smoother cycles. The aim was to avoid stoppages due to checks or packing and differing work practices among our employees. In addition, the transparent material is highly susceptible to discolouration. Automation had a positive effect in this case, because it allowed us to handle this material in a smooth, high-quality process with no stoppages or delays." A measured approach was taken to automation in order to keep a tight rein on investments.

### Manual provisioning

In order to make production as efficient as possible, automation was combined with manual activities performed upstream. Firstly, two separate parts are supplied one above the other in two alternately unlockable drawers on component insertion platens: the first is a metal external thread with central bore, while the second is a plastic peg with four chambers, which is inserted into the central bore. A pneumatic stamp presses the two



parts together to form inserts. The operating personnel can lock either of the two drawers in four press positions during manual placement in the mould. In the end, the drawer is fully inserted and the vertical MULTILIFT V robotic system picks up the pressed inserts from there. This ensures continual production. The drawer component insertion method corresponds to the mould cavity spacing and was adapted to the physiognomy of the gripper.

### Automated overmoulding

After the mould is opened, the MULTILIFT V first removes the finished parts, including the sprue, from the moving half of the mould, then moves vertically downwards and transfers the pressed inserts. The mould closes and the head area of the insert is overmoulded with a plastic cap nut. This joins the two pressed parts together in a permanent bond.

The robotic system places the fin-





## turnkey solution



During the production of the threaded flange (photo centre) the turnkey system is manually filled (photo bottom right) after which the two-part inserts are pressed (photo above). The MULTILIFT robotic system picks them up (photo bottom left), places them in the mould, removes the overmoulded finished parts and places them on a conveyor belt.



ished parts on a conveyor belt and then discards the sprue in a container. The cycle time for the production of the four threaded flanges is around 30 seconds and the system is operated in threeshifts.

This solution shows: in order to achieve optimum economic efficiency, it is worthwhile taking a detailed look at processes: which activities can be carried out manually and which need to be automated? Wilhelm Plastic treated both factors with equal importance.

The result is "cost efficient" in the truest sense of the word.

### INFOBOX

**Company:** Wilhelm Plastic GmbH & Co. KG

**Founded:** 1958 by Oskar Wilhelm

**Location:** Floh-Seligenthal, Germany

**Industries:** Automotive, electronics, medical technology

**Products:** Technical plastic parts, design parts, inserts, surface finishing, assembly and testing, mould construction

**Employees:** 62

**Machine fleet:** 25 ALLROUNDERS with clamping forces from 250 to 3,000 kN, single-component and two-component machines

**Contact:** [www.wilhelm-plastic.de](http://www.wilhelm-plastic.de)



# Functional integration for quiet results

## Veesser: Two-component pump housing for dishwashers

**D**ishwashers are getting increasingly quieter, bringing more comfort to our kitchens. This is thanks largely to automatically produced plastic parts and components with integrated functions. In the case of the housing for the hot water pump that Veesser produces as a platform component for Bosch Siemens Hausgeräte (BSH), a TPE with a hard/soft combination prevents the transmission of vibrations.

This part connects the dishwasher to the hose and is joined with the motors by Italian company Sisme Italy Spa to produce the finished pump unit. The components are then shipped to BSH for final assembly.

### Product meets stringent requirements

High demands are placed on the housing parts and mould: the washers must remain undamaged when demoulded under force; the necessary void-free injection moulding requires optimum mould venting.

The parts themselves must form a highly efficient seal and must be resistant to high temperatures and lyes. This is the only way that the hard/soft combinations can prevent leaks, protect against vibrations and ensure the required smooth-running operation.

In technical terms the process is as

follows: the TPE component cushions the vibration noises that are necessarily produced from the large resonating chamber of the dishwasher, thereby ensuring quieter operations. The inserted ring is "internally undermoulded" by the TPE component. This replaces a clamp and ensures that the washers are pressed onto the connector hose with a constant pressure. The hose simply needs to be pushed into place and, because no further fixing is required, assembly is significantly simplified.

### Complex turnkey system

The housing is produced on a turnkey system from variants of the PP TV and TPE V materials that are suitable for use in dishwashers. The turnkey system consists of a two-component ALLROUNDER 820 S with 4-cavity mould and a KUKA six-axis robot. The automation components, such as the gripper, washer feed system, impeller wheel supply system and assembly unit, all come from Kiki.

The first step is the overmoulding of the hard PP component. After the mould has been opened, the six-axis robot removes the finished parts and the TPE runner system and inserts the four automatically separated plastic rings on the nozzle end. The ejector side then rotates electrically, the mould closes and the insert is bonded with the main body by the TPE. At the same time, more pre-moulded parts are

produced from PP. The time required for the entire process is 38 seconds.

The robotic system transfers the finished moulded parts to the assembly station, where they are joined to the impeller wheels supplied there. The assembled parts are placed on a conveyor belt and fed out, while the sprue ends up on a separate conveyor belt.

This in-line solution is not just cost-efficient but also adheres to the stringent quality standards required for the entire automated production line.

### Convincing expertise from ARBURG

Managing partner Michael Veesser explains the reasons behind the decision in favour of this turnkey system: "In addition to the automation expertise offered by ARBURG as a central contact, the full integration of the robot system in the SELOGICA controller and the high level of reliability of the ALLROUNDERS were the factors that clinched our choice. Because we see ourselves as a partner to our customers when it comes to functional integration solutions like this, we also depend on end-to-end reliable technical solutions such as those provided by ARBURG."



on



Thanks to the hard/soft combination, the pump housing on dishwashers (photo top right) prevents the transmission of vibrations. The washers and impeller wheels (photos top left) are automatically supplied in the turnkey system.

## INFOBOX

**Name:** Veaser GmbH & Co. KG

**Founded:** 1946, multi-component technology since 1978

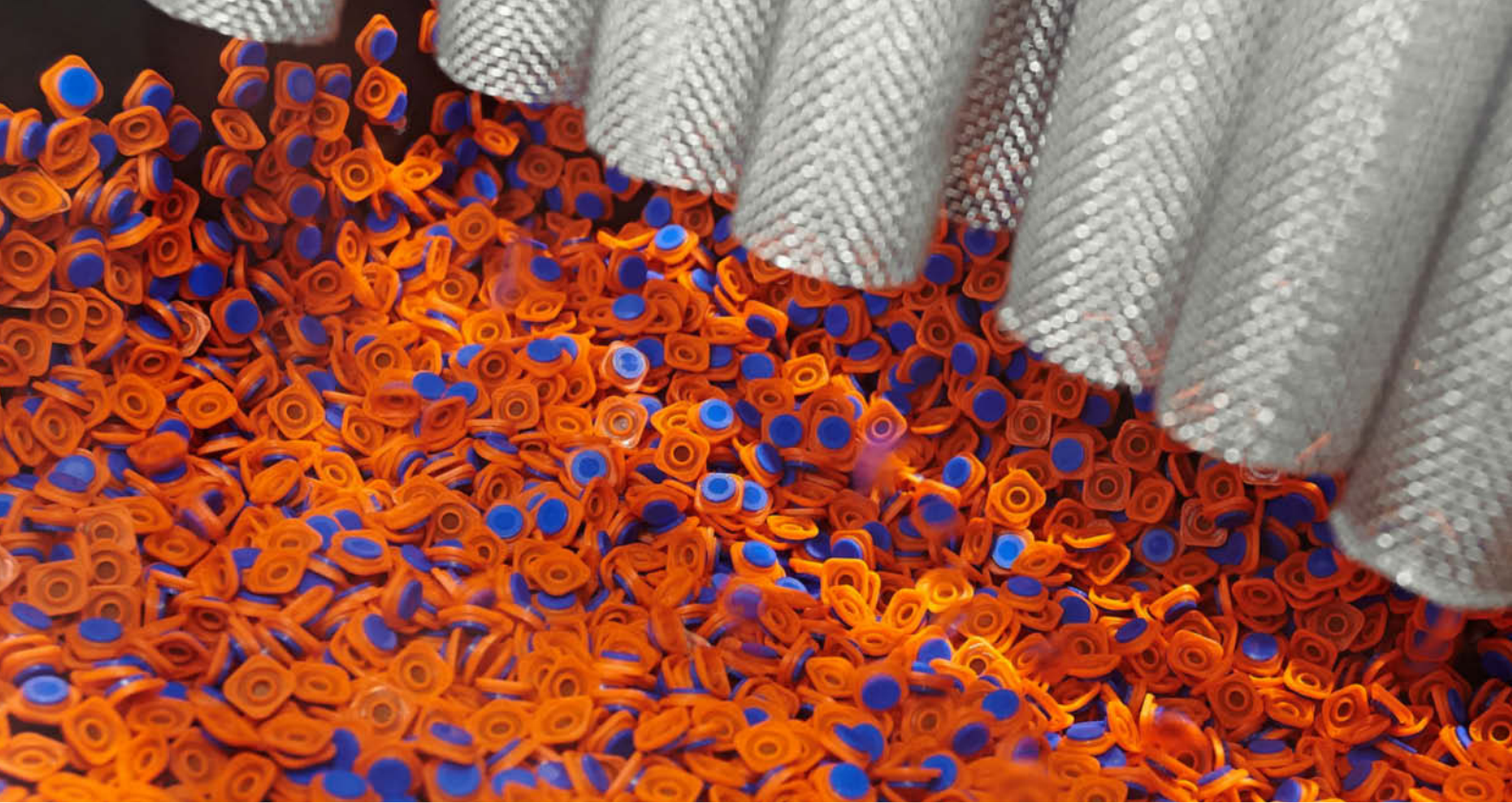
**Locations:** Konstanz, Germany, and Trenčín, Slovakia

**Products:** Single-component and multi-component moulded parts made from thermoplastic and silicone, including pressing, welding and assembly in sometimes highly automated production systems, mould construction

**Employees:** approximately 100

**Machine fleet:** 38 injection moulding machines with clamping forces between 200 and 10,000 kN, around 60 percent of them ALLROUNDERS

**Contact:** [www.veaser.de](http://www.veaser.de)



# Softly, softly

## Trelleborg Sealing Solutions: Adapted material mix and expertise

**T**he application that ARBURG presented at Fakuma 2015 in partnership with Swiss-based company Trelleborg Sealing Solutions Stein am Rhein AG represented a quiet revolution: an electric two-component ALLROUNDER 470 A was used to produce buttons for car interiors from two liquid silicones. Bonds like this offer a wide range of benefits.

Having collaborated for over 30 years, the partners decided to pool their expertise for the application shown at the exhibition: the 32+32-cavity mould with integrated electric rotary unit, the removal module and the material selection system came from Trelleborg, while the essential swift and precise machine and robot technology came from ARBURG. The LSR components were prepared by two all-electric dosing systems from Reinhardt Technik.

An orange-coloured LSR with a Shore hardness of 50 was used for the soft flange of the button, while the inner disc

consists of a harder, blue-coloured LSR with a Shore hardness of 80.

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### 0.09 gram LSR-LSR parts

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The shot weights are especially small at just 2.04 and 0.98 grams. Moulding takes place directly via a cold runner and the cycle time is around 30 seconds. Parts are removed and set down automatically by means of a vertically-operating MULTILIFT V robotic system. This removes the finished 0.09 g parts from the mould, conducts a visual inspection using a thermal imaging camera and sets them down according to cavity.

This button mould demonstrates what can be achieved with current state-of-the-art technology. Because of material and demoulding requirements, comprehensive expertise is particularly important when dealing with small shot weights in combination with a high number of mould cavities. Because silicones, unlike thermoplastics, do not perish or turn

yellow, they enable a particularly pleasant texture and unvarying appearance to be achieved on buttons.

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### A cold runner system is essential

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“Because of the material price, direct injection using cold runner needle shut-off systems is the ideal solution,” says Jakob Bleiker, Technical Director at Trelleborg Sealing Solutions. “In turn, this makes symmetrical mould filling and the balancing of high-cavity moulds, in other words the even volumetric filling of all cavities, very important indeed. That’s why we develop, design and produce our cold runner systems in-house in Stein am Rhein itself.”

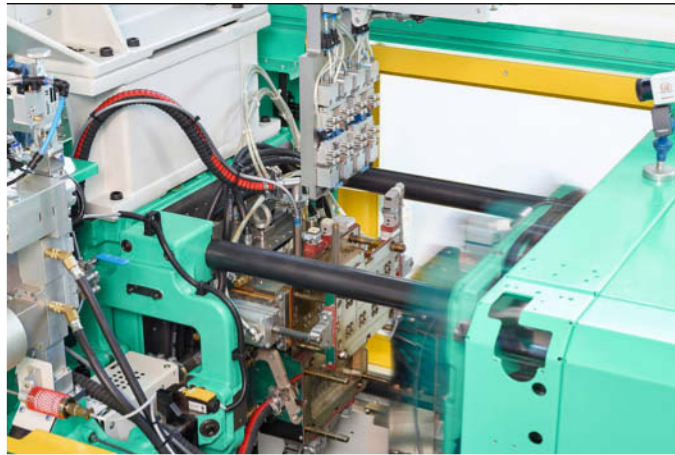
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### Automated removal

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Because the rubber elasticity of the LSR moulded parts means they are not dimensionally stable and because burr formation may be favoured by further mould separation, it is not possible to use





At the Fakuma show, buttons weighing just 0.09 grams were produced from two LSR components (bottom photo) with a 32 +32-cavity mould (photo top right). Almost 4,000 parts were produced per hour (photo top left).

## for LSR-LSR combinations

ejector pins for demoulding purposes. This means that automatic removal is more or less inevitable in batch production.

Nonetheless, Jakob Bleiker does not regard LSR-LSR injection moulding as a competitor process, but rather as a complementary process to the overmoulding of thermoplastic inserts: "The choice of a soft/soft or hard/soft combination is primarily determined by the application of the part.

### The market potential exists

Even though the greatest market potential lies in high-volume production, smaller volumes can also pay off. This requires technical feasibility in combination with cost efficient applications."

However the complexity of mould technology is in-

creasing exponentially with the number of cavities. For this reason it is important to relate development times and product life cycles to the number of parts, so as to be able to produce in a cost efficient way.

The process itself will gain significantly in importance in the future. The automotive industry in particular is calling out increasingly for ready-to-use moulded parts, according to Jakob Bleiker. However, there are also significant applications in the areas of pressure-sensitive mats (electronics), healthcare (e.g. multi-coloured pacifiers) and medical technology (e.g. catheters or respirator masks).

### INFOBOX



**Name:** Trelleborg Sealing Solutions Stein am Rhein AG

**Founded:** 1984 as Silcotech AG, part of the Trelleborg Group since 2011

**Location:** Stein am Rhein, Switzerland

**Employees:** 135

**Production:** Automated single-component and two-component LSR processing, including clean room technology, design and construction of cold runners, moulds and demoulding grippers, complete application technology

**Machine fleet:** 62 injection moulding machines, including 48 ALLROUNDERS with clamping forces from 250 to 3,200 kN

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







# Flexible uses

## INTEGRALPICKER V: External controller makes for greater independence

**T**he equipment installed on the injection moulding machines also needs to be flexible in order to be able to respond to ever-changing requirements. ARBURG has just such as flexible and mobile robot variant in its range in the retrofitable version of the INTEGRALPICKER V. An external variant of the SELOGICA controller has been developed specially for this purpose.

The new version of the INTEGRALPICKER V can be used on all ALLROUNDERS in sizes 270 to 570 built after 2000, as these models have the necessary hole pattern to enable the INTEGRALPICKER to be mounted on the fixed mounting platen. Connection is via a Euromap 67 interface and fixed waypoints. The controller hardware is located in a compact control cabinet directly on the robotic system.

In the case of new ALLROUNDERS, the retrofitable INTEGRALPICKER V can be integrated in the SELOGICA machine control system in the usual way via a VARAN interface. Another important benefit: the external SELOGICA provides the familiar graphical programming interface on the control panel of the robotic system.

### Short set-up and cycle times

This means that staff do not have to get used to a new system. The teach-in function enables fast, menu-driven set-up in only three minutes. The axis lengths, equipment, scope of functions and high level of functionality of the vertical-entry servo electric picker remain unchanged. Powerful, energy-efficient direct drive technology significantly reduces set-up and cycle time compared to pneumatic devices.

### Fast and dynamic mould-entry axis

Thus, for example, the mould entry axis accelerates extremely dynamically at 20 m/s<sup>2</sup>, reaching speeds of up to 2 m/s. Simultaneous and position-related movements are a further benefit. ARBURG is taking a completely new direction in equipping the INTEGRALPICKER V with the external SELOGICA. In the medium term, other devices from the robotic range are also to be fitted with this external controller. This will make the retrofitting of the ALLROUNDER significantly easier and more flexible.

# Things are happening!

## freeformer: Pressing ahead with practical developments

To mark the worldwide market launch, the freeformer went on show at various exhibitions and special events, demonstrating the potential of ARBURG Plastic Freeforming (APF). This innovative industrial additive manufacturing system has been very positively received throughout the world and development continues.

"We get a lot of input from our freeformer customers which we then incorporate into the development of our machines and processes," reports Dr. Eberhard Duffner, who, as Head of Development at ARBURG, is also responsible for the Plastics Freeforming area (APF).

### freeformer processes biopolymers

The option of processing plastic in granulate form, as in injection moulding, is particularly interesting. The APF team is working hard to qualify various materials.

For example, a flame-proof PC/ABS was presented at the formnext 2015 show in Frankfurt, Germany, which a freeformer used to produce a "Nautilus gear" in an additive manufacturing process. The second exhibit produced a two-component planetary roller screw drive from a bio-degradable material in combination with TPU.

"There isn't another system on the market that can manage this," said Dr. Eberhard Duffner.

The automation of additive manufacturing is also a truly unique feature. ARBURG gave a first demonstration of



how this can work at the Fakuma 2015 show in Friedrichshafen, Germany.

### freeformer automation

For the purpose of individualising the "office scissors" high-volume part, the freeformer was incorporated in a production line networked by means of Industry 4.0 technologies and linked with the injection moulding process. The freeformer communicated with a seven-axis robot by means of a Euromap 67 interface.

The process and production data for injection moulding and APF were fully recorded and archived by the ARBURG host computer system.

Unique: The freeformer processes a PC/ABS granulate with a flame-protection agent as a fully-functional "Nautilus gear" (photo above) and can be integrated automatically in a production line linked with Industry 4.0 technologies (photo left).

### Process stability and part quality

When it comes to the development of the freeformer and APF process, Dr. Eberhard Duffner and his team focus on process stability and high component quality: "We are currently working on keeping the temperature in the build chamber as even as possible, improving reproducibility and further extending the service life of the nozzle and Piezo element."



Information  
freeformer



# Additive parts make for smooth ru

**igus: freeformer processes the company's own high-performance**

**G**erman family-run company **igus is a worldwide manufacturer of energy chain systems and bearings made from plastic. The range of products is enormous: around 100,000 variants are available ex stock. Each year, the company develops 150 to 250 innovations. igus uses the freeformer to produce functional parts and prototypes from standard granulates, mainly the company's own lubricant-free, abrasion-resistant materials.**

"We develop iglidur brand tribo-plastics, which have gliding properties despite the fact that they contain no external lubricants. We use these materials to produce corrosion- and wear-resistant bearings, for example," explains Tom Krause, who works as a product manager at igus, promoting additive manufacturing. "We offer next-day delivery, even in batches as small as one item if necessary - worldwide."

The company operates around 350 injection moulding machines and has been collaborating with ARBURG in this area for many years. The wide range of products, customer-specific special solutions in small volumes and short life cycles are the

perfect way to introduce additive manufacturing to a company as a complement to injection moulding.

## **APF successfully introduced in 2015**

igus uses several processes, including ARBURG Plastic Freeforming (APF) since February 2015. "We see it as a major advantage of the freeformer that we can use our own high-performance plastics for prototypes and functional parts," emphasises Tom Krause. "This means we are now able to combine freedom in design with the wear-resistant properties of our tribological materials."

Of the more than 40 special materials that igus uses, three are specially designed for additive manufacturing. More are to follow. With the freeformer it is possible in principle to process the same plastics as in injection moulding.

The materials first have to be qualified to ensure that this can work "smoothly". Qualification includes, for example, the precise adaptation of parameters such as temperature, droplet discharge or layer thickness to the specific properties of the material.

## **Additively manufactured bearings as wear-resistant as moulded parts**

"The freeformer currently mainly processes 'igidur I180', which is suitable for industrial applications and uses this to produce parts such as bearings, grippers and gearwheels in an additive manufacturing process," explains Tom Krause. "Our tests showed that this material is around fifty times more resistant to wear than conventional ABS for 3D printing. In the test laboratory, a bearing made from the injection moulding material 'igidur J260' in an additive manufacturing process was







Photos: igus

# 3D printing

## plastics

found to be just as wear-resistant as an injection-moulded part made from the same material.”

In general, additive manufacturing offers significantly more freedom in geometric design than injection moulding. When it comes to the development of new products directly from 3D CAD data, changes in design can be implemented immediately, so that the next generation of the prototype or design sample, or an ongoing product can be quickly produced without requiring a mould.

### igus provides a 3D printing service

This is the ideal way to test a new product in practice before it is moulded in large quantities. The additive manufacturing process is also an ideal way to produce replacement parts. Since spring 2015, igus has taken things one step further and now offers its own 3D printing service. “The customer simply uploads his 3D CAD data to our website. We check whether his requirements are feasible, produce a quote and ‘print’ the required part from our iglidur material after we receive the order,”

explains Tom Krause. “The freeformer also allows us to process two different components. Thus, for example, we can use support material to create complex geometries or to produce a component mainly from conventional ABS, reserving our wear-resistant high-performance plastic for the sliding surfaces only.” igus is planning to make more injection moulding materials “printable” in a step-by-step approach. Tom Krause believes that the iglidur standard materials will be of particular interest for the future, alongside specialist materials such as conductive products and materials that are approved for use in the food industry.

Product manager Tom Krause promotes additive manufacturing at igus (photo above). The freeformer can be used to produce parts such as fully functional gears and bearings from materials produced within the company (photos above and below left).

### INFOBOX

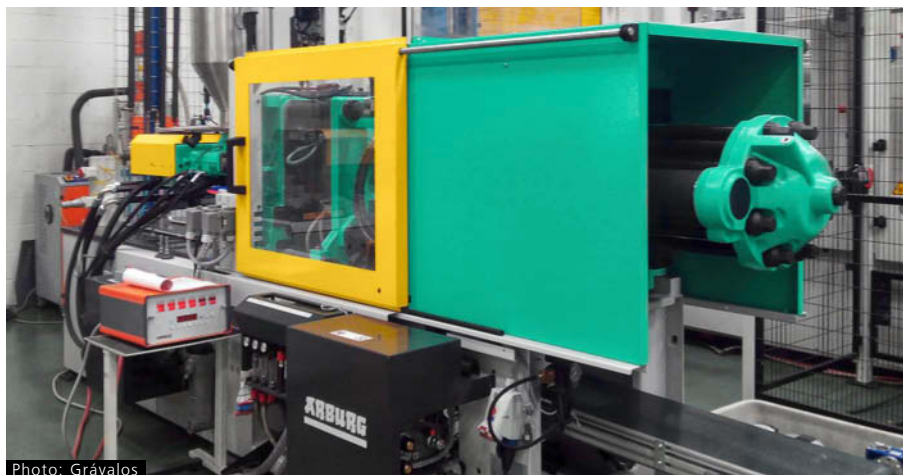
- Name:** igus GmbH
- Founded:** 1964 by Günter and Margret Blase
- Location:** Production in Cologne, Germany
- Turnover:** 469 million euros
- Employees:** 2,700 (worldwide)
- Products:** Leading manufacturer of energy chain systems and polymer floating bearings, 100,000 product variants ex stock
- Service:** 3D printing of parts on the basis of design data
- Contact:** [www.igus.de](http://www.igus.de)



# Making the unusual

**Construcciones Grávalos: High-tech production and expertise in**

**C**omponents for Ceran hobs or products with multiple metal inserts made from fibre-filled plastic are just some of the specialist products that Spanish mould and moulded part manufacturer Construcciones Grávalos produces as standard. The fleet of machines is as varied as the product range, which, in addition to two-component ALLROUNDERS, also includes vertical and rotary table machines, and which undergoes continuous further automation together with ARBURG.



Mould and moulded part manufacturer Construcciones Grávalos has been successfully collaborating with ARBURG since 1980. Hence, mint green is the dominant colour in the production facilities in Zaragoza, Spain and Lodz, Poland.

However, owners Joaquin and Jorge Grávalos are not just fans of the technology, but also of the first-class support offered by the Spanish and German

ARBURG team when it comes to the production of their high-end moulded parts.

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### **Convincing technology and service**

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The brothers find the machine service is excellent. They believe that the ALLROUNDERS are the best machines on

the market for the range of tasks facing their company.

Joaquin Grávalos describes the strategy: "Continuous automation and the benefits that we derive from the combination of the injection moulding, pressing, metal coating, automated assembly and internal mould construction with mould flow analyses and prototyping have helped us





Specialities from Grávalos: Temperature-resistant platforms for Ceran hobs and gearbox covers, both made from PPS with high proportions of fibreglass and talcum (photo above, left to right). ALLROUNDERS play a key role in cost-efficient manufacture (photo below).

# usual specialities

to achieve a key position within the market and ARBURG has played a significant role in this."

## Automation reduces costs

His brother Jorge adds: "We produce our technical parts in Europe mainly for the Spanish, German, Turkish, Polish and US markets. The industries where we supply most of our products, domestic appliances and automotive, are under particular pressure to keep a tight rein on costs. We manage to do this with individual automation solutions, which we develop together with ARBURG, adapting them to our needs."

Examples are the two turnkey systems, each of which is built around an ALLROUNDER 370 S with MULTILIFT V. These operate in shift mode and produce four gearbox covers in a cycle time of 48 seconds. For this, 16 brass bushings are inserted in a 4-cavity mould and overmoulded with PPS with fibreglass

and talcum ratios of 17 percent each at a mould temperature of 140 °C.

In the domestic appliance sector, Grávalos has specialised in the production of Ceran hobs. This not only involves the injection moulding of the plastic carriers made from temperature-resistant PPS with a 30 percent talcum and fibreglass content, but also the integration of the copper wire. The proof of excellent quality is found in the fact that Grávalos has been consistently nominated as the number one supplier to BSH (Bosch-Siemens-Hausgeräte) for the last eight years in succession.

## INFOBOX



**Name:** Construcciones Grávalos, S.A.  
**Founded:** 1946 by Herminio Grávalos  
**Locations:** Zaragoza, Spain and Lodz, Poland  
**Turnover:** 40 million euros (2015)  
**Production area:** 16,000 square metres  
**Employees:** 325  
**Industries:** Domestic appliances, automotive, electronics  
**Products:** Technical plastic parts and components that are assembled to form a complete module  
**Materials:** PPS and PP with talcum, PA 6.6, POM, ABS and TPE/PC  
**Machine fleet:** 70 machines, including 51 ALLROUNDERS with a clamping force of 350 and 5,000 kN  
**Contact:** [www.gravalos-sa.com](http://www.gravalos-sa.com)



# The future is light

## Bond-Laminates: Tepex® thermoplastic composite sheets for high-

**T**he thermoplastic composite sheets produced by Bond Laminates GmbH have a great future as alternatives to classic materials and in automotive lightweight construction. One example of this is the "Lightweight lever" exhibition project in cooperation with ARBURG, which combines thermoplastic composite sheeting with the Fibre Direct Compounding (FDC) lightweight injection moulding process. In this interview with today, Martin Klocke, Head of Technical Marketing & Business Development Tepex Automotive at LANXESS Deutschland GmbH, describes the properties, requirements and potential for the future.



Photos: Bond Laminates

**today:** How does the exhibition project reflect the future for thermoplastic composite sheets?

**Klocke:** The production of the lightweight lever shows the superior suitability of Tepex® for integration in mass production processes, such as plastic injection moulding and extrusion. Excellent mechanical properties, such as strength and rigidity, are achieved even with very thin walls. In addition, the project also shows how ARBURG demonstrates a high degree of technological expertise by combining different lightweight construction processes such as the FDC process and "Tepex Hybrid Moulding".

**today:** How has the environment for thermoplastic composite sheets developed?

**Klocke:** Things have developed so rapidly for automotive lightweight construction in recent years that all sorts of new materials and processes are under consideration in order to meet the higher demands of lightweight construction. That's why we at LANXESS/Bond Laminates have now established a higher group for technical marketing and business field development in order to meet this demand more effectively. There are similar trends in other industries. The demand for lightweight construction and cost-efficient technologies is therefore growing.

**today:** Who are your partners and how is cooperation working out?

**Klocke:** In current development pro-

Martin Klocke is very pleased with the success and the future potential of thermoplastic composite sheets, which come in a variety of versions (see the photo below).

jects these are mostly the OEMs and tier 1 and tier 2 suppliers. Process development partners are coming on board at a very early stage in these projects. These are mould construction companies, machine and handling providers and heating technology manufacturers. We have a broad range of experience in applications involving thermoplastic composites. In addition,



## strength and lightweight composite parts

we have developed simulation methods that represent the production process, in other words the draping of the thermoplastic composite sheet, as well as the mechanical structure of the part produced. Thus, together with the customer, we optimise the material structure and thickness on the basis of specific requirements.

**today:** What material combinations are available for the process of overmoulding thermoplastic composite sheets?

**Klocke:** Cars call for materials for purely structural functions that are based on fibreglass reinforcements and PA6, PA66 and PP. A wide range of injection moulding materials is also available from LANXESS for PA6 and PA66. This combination on a polyamide basis offers the highest performance for structural parts, as can be seen from the world's first mass-produced brake pedal made from a thermoplastic composite material.

**today:** What does the future have in store?

**Klocke:** I am sure that our portfolio of materials will continue to grow into the future. In the medium term we are seeing a large number of projects that use this extended range of materials for batch production. While the trend in the automotive

### "Lightweight lever" exhibition project

- Combination of fibre direct compounding (FDC) and overmoulding of thermoplastic composite sheets
- High-strength, stable composite part, over 500 millimetres long and weighing just 200 grams
- Process-secure, gentle heating of the thermoplastic composite sheets in the gripper of the six-axis robot; transfer to the LIPA (Lightweight Integrated Process Application) mould when the precise forming temperature is reached
- Overmoulding with FDC process: Feeding of flexibly cut fibres directly into the liquid melt and homogeneous distribution
- Partners: Georg Kaufmann (mould), fpt Robotik (automation), Bond Laminates (thermoplastic composite sheets)



Video:  
Lightweight  
lever

industry is very much towards lightweight construction with partial substitution of metals, the direction taken in sport and entertainment electronics is towards an ingenious mixture of optical and lightweight technologies.

### INFOBOX

**Name:** Bond Laminates GmbH

**Group:** A 100-percent subsidiary of LANXESS AG

**Founded:** 1997

**Employees:** approximately 80

**Industries:** Automobile industry, sports and electronics industry

**Products:** Development and manufacture of tailor-made composite materials from plastics, e.g. reinforced with fibreglass (Tepex®)

**Contact:** [www.bond-laminates.com](http://www.bond-laminates.com)



# TECH TALK

Oliver Schäfer, Technical Information

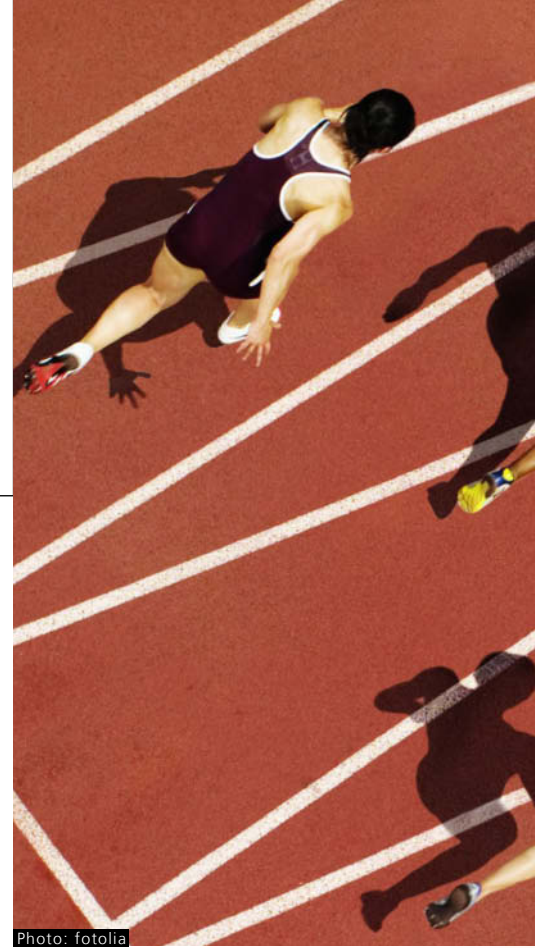


Photo: fotolia

# Guaranteeing an a

## Making the complex simple - preparing the way for Industry 4.0

**I**ncreasing demand for productivity leads to ever more complex processes that need to remain manageable. Solving these challenging tasks calls for IT integration and systematic data evaluations - central factors on the way to Industry 4.0. Optimisation begins in detail with the individual machines.

Users need to be able to adjust and control the production process, however complex it may be, intuitively without requiring specialist knowledge. The aim is to create a "smart" machine that integrates peripherals with ease, analysing and regulating process parameters and providing far-reaching assistance functions. ARBURG has already been working for many years on self-regulating systems that increase process reliability and product quality.

<p><b>Fast set-up times and configuration</b></p>	<ul style="list-style-type: none"> <li>• Graphical sequence programming with immediate plausibility checks</li> <li>• Set-up assistant (today 44)</li> <li>• Self-configuring production cell (real-time Ethernet and OPC-UA interface)</li> </ul>
<p><b>Simple start of production</b></p>	<ul style="list-style-type: none"> <li>• Automatic ON/OFF (today 45)</li> <li>• Sub-sequences (today 50)</li> <li>• Heat-up sequence (today 52)</li> <li>• Part status (today 57)</li> <li>• Reference cycle</li> </ul>
<p><b>Constant process and high parts quality</b></p>	<ul style="list-style-type: none"> <li>• Position-regulated screw</li> <li>• Regulation via reference curve (today 35)</li> <li>• Adaptive heating zones</li> <li>• Automatic clamping force control</li> </ul>
<p><b>Quality assurance</b></p>	<ul style="list-style-type: none"> <li>• Automatic reference value determination</li> <li>• Automatic fault analysis</li> <li>• On-screen maintenance notification (today 42) – central registration with OPC UA</li> </ul>





# dvanantage

Smart ALLROUNDER:  
SELOGICA features at a glance

## Position-regulated screw

A good example is the position-regulated screw: the continuous monitoring of the screw position and the active re-adjustment of the injection speed maintain a constant flow front during injection moulding. This makes it possible to balance process variations caused by material batches or traces of wear. The cavities are filled in a reproducible process and the dimensions of the parts are precisely adhered to.

Another example is the ongoing IT integration within the machine. Based on a modern real-time Ethernet (see today 55) the principle of a “self-configuring”

production cell has been implemented for ALLROUNDERS. Functional component assemblies, such as additional injection units, as well as measuring amplifiers, I/O modules, robotic systems and associated gripper technology or vacuum generators are no longer permanently connected to the machine. Instead, these are connected to the SELOGICA controller by means of connectors and are automatically identified by these when inserted - even during operation.

## SELOGICA recognises component assemblies

Thus, for example, in the case of a robotic system the complete device specification, such as type, number and length of axes, is recognised and operational functions are made available. Thus, integration requires no extra effort. At the same time, the functional assemblies are no longer

linked to a particular machine, but can be used flexibly. However, Industry 4.0 is still a vision for the “production of the future” in many areas. As the examples show, the company is already well on the way to implementing this.

## ARBURG offers numerous features

Many detailed solutions already exist that continuously enhance the production efficiency of ALLROUNDERS. The Ethernet OPC UA interface – the future standard for Industry 4.0 – can be used to integrate these elements online, preparing them for the future.

# THE ART OF PRODUCTION EFFICIENCY



36 million kilometres annually. No great art for our robotic systems. As a specialist for production-efficient turnkey solutions, we offer you decisive future perspectives. So let us accompany you along the way to turnkey systems.