

# today

The ARBURG magazine

Issue 46

2011





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## MASTHEAD

today, the ARBURG magazine, issue 46/2011

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Is it art? Or not? State-of-the-art production is certainly involved: In order to produced high-quality hoses, Schlemmer combines extrusion and injection moulding in a single process. Artistry indeed!

**ARBURG**



## Dear Readers,

The successful start to 2011 continues unabated. Impressive evidence of this was provided by our Technology Days in March.

With more than 5,200 visitors in four days, all records for the event were broken. The Technology Days, however, did not only excel in terms of visitor numbers, but also and more importantly in terms of quality. This was clearly demonstrated by the visitor questionnaire, in which top marks were awarded throughout. In addition to presenting the product, application and service ranges, we have again celebrated a world premiere, this year with the introduction of the new electric EDRIIVE machine series. Learn more about its application spectrum in the interview with our Managing Director Technology & Engineering, Herbert Kraibühler. Furthermore, we will introduce you to two very different applications in the report entitled "ARBURG efficiency". While one features a variety of manual operations, the other is fully automated.

Nevertheless, both are highly efficient production solutions. These examples demonstrate that all manner of requirements can be met with ARBURG as a partner. This is made possible thanks to the unique modularity of our ALLROUNDER machines, which celebrate their 50th anniversary this year. In keeping with this topic, we have included a picture gallery as a centrefold, which will no doubt soon decorate a number of walls. Moreover, the current issue contains exciting customer and project reports from around the world.

I hope you enjoy reading the new issue.

Juliane Hehl  
Managing Partner & Managing Director



# Efficiency in t

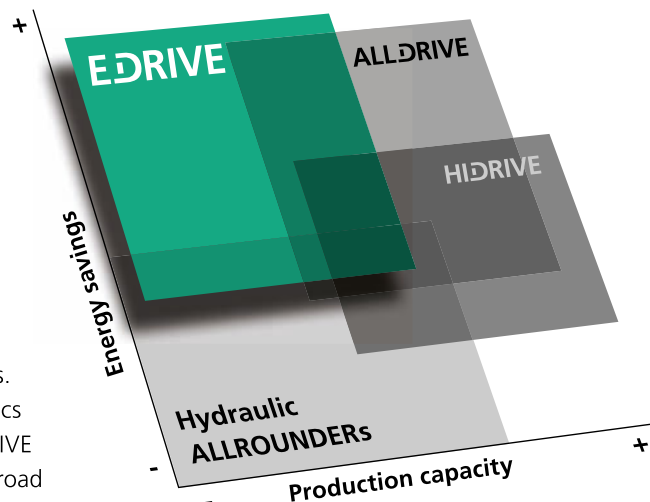
Interview with Herbert Kraibühler on the

**“With the efficient expansion of our modular range, the overlaps are in the customers’ interest,” explains Herbert Kraibühler, Managing Director Technology & Engineering. In the today interview, he describes the positioning of the electric EDRIVE machine series within the ARBURG machine world.**

**today:** How do the ALLROUNDER E (EDRIVE) machines fit into the ARBURG product range?

**Herbert Kraibühler:** If we compare the existing ARBURG machine series with the new EDRIVE series, the technical specifications of the electric ALLROUNDER A are clearly positioned in the high-performance segment. The ALLDRIVE machines feature high dynamics, the corresponding injection speeds and short dry cycle times, which are significantly above those

for part requirements in the standard segment. In terms of productivity and high injection speeds, our hybrid HIDRIVE machines are simply unbeatable. The new ALLROUNDER E machines cover similar areas of application the hydraulic ALLROUNDER S machines. The performance characteristics and drive design of the EDRIVE series are adapted to a very broad application range rather than to maximum performance. The equipment options of the ALLROUNDER E machines share this aim, e.g. with regard to the defined mould functionality. No compression injection moulding option, for example, is available for the EDRIVE series. The new basic ARBURG electric ma-



chines enable economical, cost-effective entry into the world of electric machines.

**today:** But if hydraulic and electric ALLROUNDERS share a similar range of



# EDRIVE

# the range

## new electric EDRIVE machine series

applications, namely the production of standard and technical moulded parts, what ultimately differentiates these machines from one another?

**Herbert Kraibühler:** When deciding on the purchase of one or the other machine series, the primary consideration should never be the price, but always functionality. In design terms, all the main axes of the electric EDRIVE machines are driven separately. With the hydraulic ALLROUNDER S machines, in contrast, there is only one drive train. This means that the hydraulic ALLROUNDER S machines in the basic spec version can only perform serial movements, whereas the basic ALLROUNDER E machine can perform the most important machine movements simultaneously. Our customers should therefore always bear the specific application in mind before choosing their machine. This also

means that the ALLROUNDER S and ALLROUNDER E machines can only be compared to a limited extent, because as an electric machine, the basic EDRIVE machine can perform simultaneous movements that the ALLROUNDER S machines are only capable of with additional equipment.

**today:** With regard to energy efficiency, the electric ALLROUNDERS have advantages over the hydraulic machines. Where precisely do these lie?

**Herbert Kraibühler:** The high efficiency of the servo-electric drives and the toggle-type clamping unit ensure energy-efficient operation of our electric machines, including the new ALLROUNDER E models. Energy recovery of the servo motors during braking also has a beneficial effect on the machines' overall energy consumption. Together, these factors

combine to reduce energy consumption by 25 to 50 percent. This is why the ALLROUNDER E machines also bear our "e<sup>2</sup>" energy-efficiency label, the ARBURG mark denoting particularly energy-optimised operation.

# Do you sleep well?

## ResMed: Specialists for products to treat sleep-related breathing

**Y**ou only realise the value of a healthy and revitalising night's rest when you are suffering from sleep deprivation. The reason for the problem may be a sleep-related breathing disorder, many of which are caused by pathological cessation of breathing, or so-called obstructive sleep apnoea (OSA). Products from ResMed, an internationally active corporate group with its manufacturing headquarters in Sydney, Australia, can offer fast-acting relief.

ResMed is a leading manufacturer of medical breathing equipment and specialises in products for the diagnosis and treatment of sleep-related breathing disorders.

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### Enormous market potential

The market potential is enormous because it is estimated that many millions of people, often unknowingly, suffer from OSA. This illness is as common as asthma or diabetes. However, the proportion of diagnosed and treated OSA disorders is still very low at about 5%.

One of the key milestones in treatment was the invention of CPAP therapy (CPAP= continuous positive airway pressure) by Prof. Colin Sullivan in Australia in 1981. This therapy does not require either medicines or invasive operations and has immediate results.

ResMed was founded in 1989 with the aim of marketing a nasal CPAP device for the non-invasive treatment of OSA. This device applies air under gentle pressure by means of a small mask placed over the nose. The pressure acts as an "air splint",



keeping the upper air passages open, preventing breathing cessation almost completely.

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### High end products from LSR

Over the years, many revolutionary features and designs have been developed in the area of nasal masks, full face masks, nose cushion systems, vented and unvented masks, as well as paediatric masks. ResMed sources many components from certified suppliers. This allows the company to focus on developing its core competency in moulding parts from highly transparent liquid silicone rubber (LSR). Because they come in direct contact with the body, they are subject to very high quality requirements in terms of

performance and biocompatibility. The geometry of the components is also very complex, comprising both thin and thicker areas and making stringent demands on material, mould design and manufacture, injection moulding process and parts handling. Demoulding free-form surfaces and undercuts can be challenging and therefore requires unique solutions.

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### Customer-specific configuration of the machines

The machine fleet, which produces over 30 million moulded parts annually, including many hydraulic and electric ALLROUNDERS. Ben Grellman, Head of Manufacturing – Patient Interface, explains that the decisive criteria are the

## g disorders – with expertise in LSR processing

Many millions of people suffer from sleep disorders. A nasal device (left) offers relief. The LSR components of the mask (right) are manufactured on ALLROUNDER machines.

customer-specific configuration of the ALLROUNDERS, which perfectly meet the stringent requirements in terms of precision and reproducibility, and their intuitive operation thanks to the SELOGICA control system.

At present clamping forces range from 250 to 2,500 kN with the trend towards larger machines as multi-cavity moulds, robotic systems and complete production cells are increasingly used.

### Automation for flexibility

“The automation solutions enable us to achieve a high level of flexibility with our LSR parts with regard to upstream and downstream production steps.”

These include, for example sorting, inspection and testing. ResMed uses the ARBURG host computer system (ALS) for a detailed production planning and for monitoring purposes.

According to Gary Robinson, VP Global Supplier Alliance, the close professional cooperation with ARBURG and its Australian

trading partner Comtec, which dates back to 1998, covers many aspects of production. “ARBURG continues to be a valued business partner,” says Gary Robinson, who sees the ALLROUNDERS as an important basis for efficient injection moulded part production.



Photos: ResMed

Todd Speechley, Gary Robinson and Ben Grellman (from left) are completely satisfied with quality of the sophisticated LSR parts.

### INFOBOX

**Founded:** 1989 by Dr. Peter Farrell, CEO and Chairman

**Employees:** Increase from nine (1989) to over 3,200

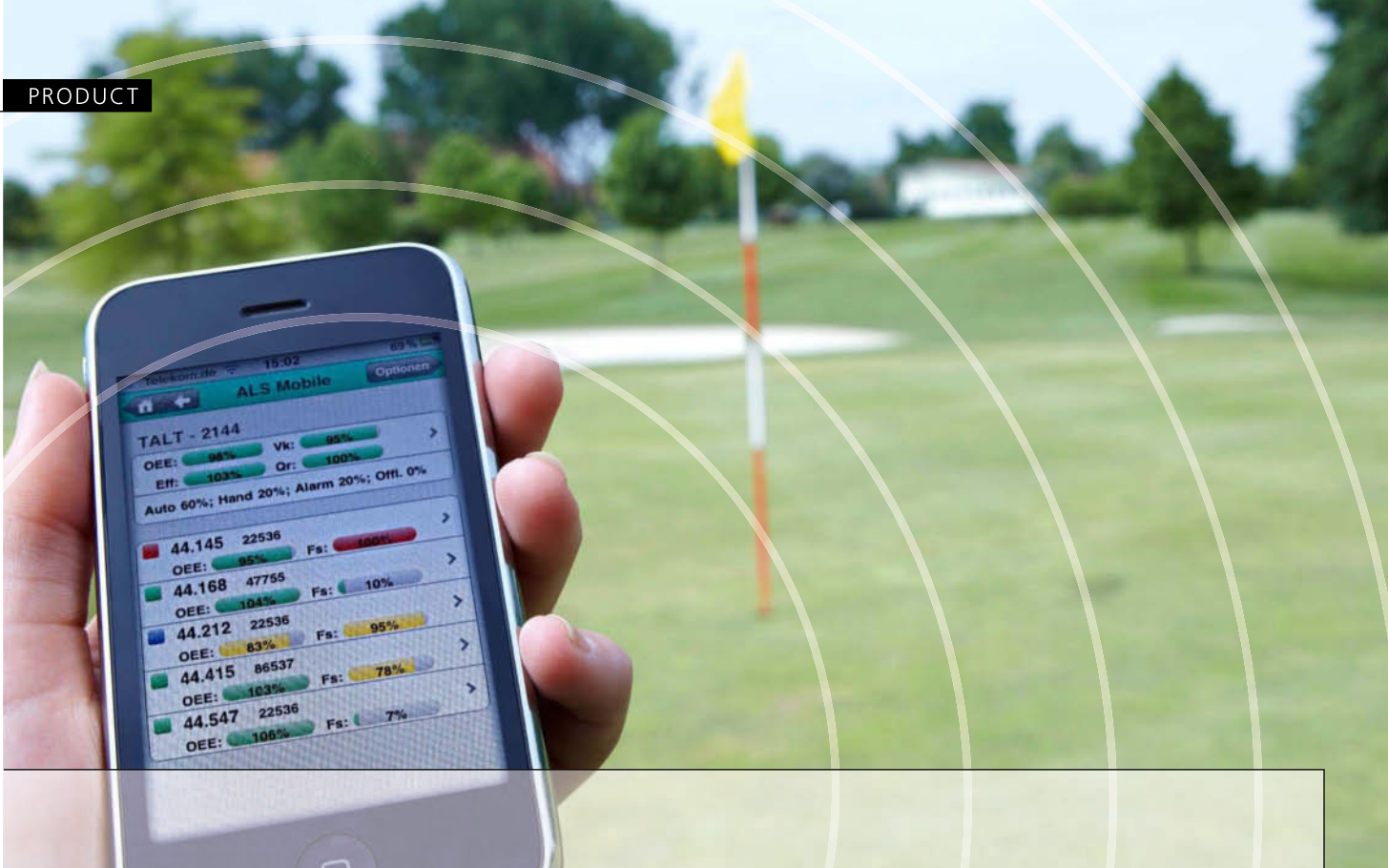
**Sales revenue:** Increase from US\$1 million (1990) to over US\$1 billion (2010)

**Locations:** Production facilities in Australia, Singapore, France and USA, worldwide sales through subsidiaries and trading partners in over 70 countries

**Certification:** ISO 9001-2008, ISO 13485-2003, FDA QSR 21 CFR Part 820 and Japanese MHLW Ministerial Ordinance No. 169, 2004.

**Products:** Products for diagnosing and treating sleep-related breathing disorders

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



# Always up-to-date

## ALS Mobile: Key data via smartphone

**T**he ARBURG host computer system (ALS) is a valuable instrument for planning and recording machine and order data. The new "ALS Mobile" analysis tool, which ARBURG introduced at its Technology Days in March 2011, offers significantly greater transparency. In future, key parameters and production data can be called up in real time.

Up-to-date information on production is now not only available from the office PC. It can now also be called up from wherever it is required. Authorised persons can access their internal company network at any time via their smartphone in order to view momentary ALS data. This means that it is available at all times, for example during a meeting or when a customer asks when his components will be ready.

Those using mobile ALS access to the injection moulding processes are directly involved in the information flow and can fully exploit the available capacities. This is particularly useful for just-in-time suppliers and production managers seeking to

utilise their personnel and machines as efficiently as possible. The more smoothly each system runs and the greater its degree of utilisation, the more earnings it generates.

### Mobile analysis of key data

In order to continuously measure and control performance, the current OEE values, for example, can be transmitted via a smartphone. This Overall Equipment Efficiency, a quotient based on quality, efficiency and availability, provides an indication of value added, from individual machines and locations through to total production. Furthermore, the ALS analysis tool provides insights into momentary cycle times, running orders, shifts, batches and the current utilisation level of the machine fleet.

All the data can be displayed in a number of ways, but for security reasons it cannot be transmitted, stored or printed outside the internal company network. Mobile access is possible from outside via a secure Virtual Private Network (VPN

Thanks to ALS Mobile, decision makers can now respond in a very flexible manner and call up production data from anywhere in real time.

tunnel) or via the company's wireless LAN network. In addition to smartphones, other web-capable devices such as PC terminals or the relevant scanners can be equipped with the new functionality.



# Efficiency from ARBURG

## In-depth consulting for optimal injection moulding solutions

**A**RBURG concentrates its comprehensive injection moulding know-how at its central headquarters in Lossburg. Dr. Thomas Walther, Head of the Application Technology department and Oliver Giesen, Head of the Projects department provide insights on how they configure customised injection moulding solutions based on customer requirements.

**today:** What do you do when a customer comes to ARBURG because he'd like to produce, for example, a housing with an inspection window?

**Dr. Thomas Walther:** First of all, we make a feasibility assessment. How could the solution be implemented in application technology terms? What might a suitable mould and machine concept look like? Could the customer, instead of producing the two parts separately, dispense with downstream assembly, e.g. through multi-component injection moulding, and thereby achieve cost advantages?

**today:** ARBURG evidently offers numerous options for enhancing efficiency. At what point does the Project department become involved?

**Oliver Giesen:** As soon as the components don't just need to fall into a crate, in other words, as soon as automation is required. For this purpose, we examine the process sequence. Is it, for example, cheaper to transfer the parts using a rotary unit in the mould, or could an existing robotic system perform the



Dr. Thomas Walther (left), Application Technology, and Oliver Giesen, Projects, during the today interview.

task? Considerations of this kind allow us to optimise the capital investment costs.

**Dr. Thomas Walther:** To find the ideal combination from all the many possibilities, we take all the individual factors into account. The size, number and arrangement of the mould cavities, as well as the robotic system, for example, always influence machine size and consequently the overall concept. We therefore jointly discuss a variety of different scenarios.

**Oliver Giesen:** Exactly, that's our advantage. Because we have a wealth of options to draw from, we're always able to create synergies. A typical example: How can several injection units be most effectively combined with a robotic system while simultaneously reducing the cycle times? This is why we're a manufacturer of both machines and robotic systems, as well as a provider of comprehensive application-specific consulting.

**Dr. Thomas Walther:** It's precisely this mix of different areas of expertise that's decisive when it comes to reducing unit costs. In order to find the appropriate optimal injection moulding configuration, specialist knowledge is required in all fields. In order for ARBURG to follow all the injection moulding trends, we have wide-ranging know-how at our disposal and are in a position to have a say with regard to all processes in all sectors.

**Oliver Giesen:** In essence, our task is to find the simplest and most effective overall solution. ▶▶

**today:** Does that mean for you that efficient production is only possible by investing in automated systems?

**Dr. Thomas Walther:** Not necessarily – the solutions can differ widely. Efficient production is possible with a well-organised manual workstation, even in high-wage countries. This was demonstrated, for example, by an application example from Kufner at the ARBURG Technology Days 2011 consisting of “manual filter production”.



## Example: Manual filter production

**K**ufner uses a vertical ALLROUNDER 375 V with a manual workstation to produce fuel-tank strainers in production volumes of up to 3,000 very flexibly and to a high quality standard.

Both the operator and the machine are utilised to the full. In a cycle time of around 35 seconds, the ALLROUNDER encapsulates the upper and a lower sections of a filter housing in a 1+1+1-cavity mould before joining the two parts in a subsequent cycle. Sufficient time is available for the operator to simultaneously inspect the previously moulded filter for defects, weld on an earthing clip, fit a closure plug and assemble the finished part.

### Simultaneous working: Operator and machine utilised to the full

When the mould opens, the operator removes the next filter, places the next two pre-moulded parts into the third cavity and inserts new housing halves into the two free cavities. Eighty-five parts are produced per hour in this manner, more than 600 per shift, including machine and mould maintenance.



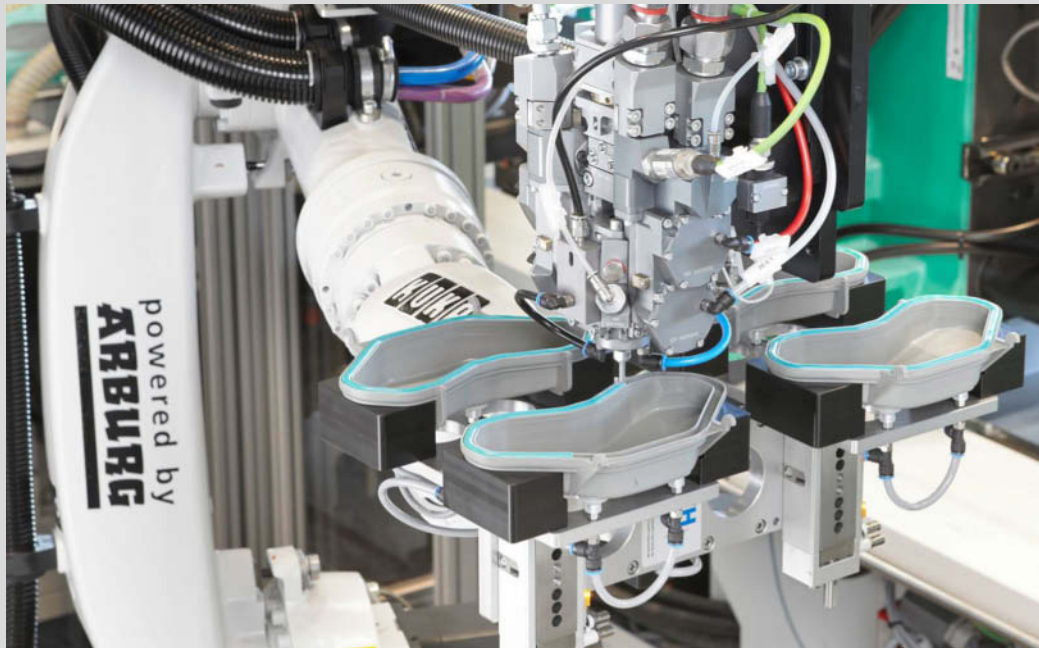
Kufner produces filters in small batches on manual workstations. The system is centred around an ALLROUNDER 375 V with a 1+1+1-cavity mould. The operator and injection moulding machine work simultaneously. Each part requires seven work steps.

In order to ensure a high level of availability and to prevent production bottlenecks, three alternative machines are in a state of production readiness at Kufner. The set-up time for a vertical ALLROUNDER, including peripherals, material and programme changeover is under 45 minutes, making it ideal for small batch sizes.



**today:** How can the efficiency of automated systems be further enhanced? Can you name an example of very complex customer requirements in this regard?

**Oliver Giesen:** Individual solutions are part and parcel of good consulting for us. The result is always spot on for the customer, as the example of combined injection moulding and foaming shows. At the Technology Days 2011, ARBURG presented this new MOLD'n SEAL process jointly with Sonderhoff.



## Example: Injection moulding and foaming

**In order to enhance efficiency, unconventional production steps are increasingly being integrated into the injection moulding process. One example of this is the foaming of seals implemented with ARBURG partner Sonderhoff.**

Housing covers for motor vehicle headlights are injection moulded and immediately provided with a PUR foam seal. In comparison with the seal foams used in conventional downstream production steps, the curing time has been reduced from ten to under three minutes.

The components are initially injection moulded on a hydraulic ALLROUNDER 570 S with a clamping force of 2,200 kN and a 4-cavity mould from B&K. A six-axis robotic system performs all part handling tasks and links the injection moulding with the subsequent PUR foaming process.

### Robotic system follows foam seal contour

The KUKA robotic system removes the four still-warm moulded parts, which feature a groove for the seal, and transfers them directly inline to a two-component

dispensing unit from Sonderhoff. It individually positions each housing under the mixing head before evenly and precisely following the contour of the seal according to a freely programmable path using the FIPFG principle (FIPFG = formed in place foam gasket), while the mixing head nozzle applies the PUR bead.

### Non-stop parts production

In order to allow processing within the injection moulding cycle, Sonderhoff has developed a new recipe for the two-component foam. No pauses are necessary for cleaning the mixing head.

Thanks to ARBURG, the complex movement sequences are easy to programme. This is because the SELOGICA user interface is implemented in the control system of the six-axis robotic system and the robotic control system is fully integrated in the machine control system. Due to this tight integration, only one data record is required for the entire production unit.

The cycle time for injection moulding, handling and foaming of the four parts is of only 44 seconds. More than 2,600 parts are manufactured "non-stop" in a single shift. Curing of the new PUR foam

The new MOLD'n SEAL process drastically shortens foaming. A six-axis robotic system removes the warm moulded parts from the ALLROUNDER 570 S and directly follows the seal contour inline under a PUR dispensing unit, before setting down the parts on a conveyor belt.

is accelerated through the heat of the moulded parts. No long curing belts or intermediate storage are necessary. A single robotic system performs all the handling operations. The new inline process also saves considerable time, costs and space in production.





Photo: danielschoenen Fotolia.com

# As strong as a tree

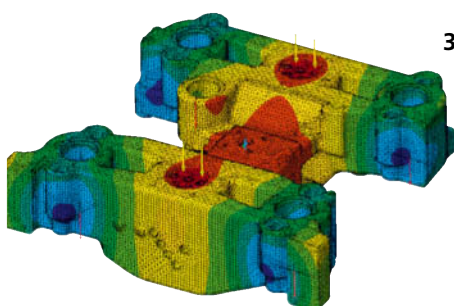
## Learning from nature: How can high forces be withstood?

**B**ionics, i.e. using nature as a model for technology is a current trend. Scientists have, for example, investigated how branches withstand strong winds and bear tons of snow. The answer: They grow in a manner which allows the loads to be distributed to optimum effect. The experts at ARBURG are using precisely the same principle in order to develop structurally optimised cast parts.

During injection moulding, huge forces are exerted, particularly on the support and mounting platens.

### Designed for precise loading

These cast parts need to be designed precisely in accordance with the anticipated loads: neither oversized nor excessively weak. "Specifically, this means eliminating any unnecessary material while still achieving the required resilience," says Dr. Eberhard Duffner, Head of Development. "Since we've been using simulation software to optimise the platens



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of our large ALLROUNDERS in advance according to ARBURG specifications, we have succeeded in drastically reducing design times and achieving optimum dimensioning of the cast parts in accordance with the decisive deflection criteria. Weight savings also represent a cost factor. Moreover, the injection moulding process is rendered even more reliable for our customers."

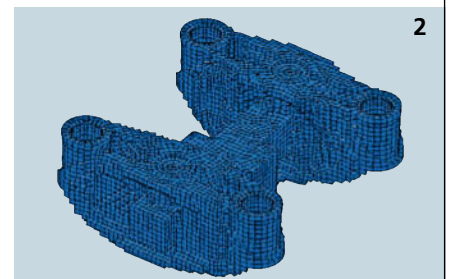
### Nature knows best

What a tree "naturally" does right when growing is calculated by the software according to the SKO (Soft Skill Option) method, e.g. during the optimisation of a support platen. Based on the maximum possible installation space, the areas which are not subjected to significant loads are automatically removed. This procedure is repeated dozens of times. With each new calculation of the force distribution, the geometry approaches the optimum and what remains is a load-resisting framework. The component has no excess weight but nevertheless possesses the necessary resilience.

Based on this planar model, a CAD model can be created and the final component produced. The actual deflection is re-calculated using the so-called Finite Element Method (FEM) and the geometry corrected slightly as required. Using these methods, ARBURG also carries out



1



2

Support platen of an ALLROUNDER 630 S: After definition of the maximum installation space (1) the cast part was structurally optimised using the SKO method in order to achieve the ideal relationship between mass and deflection (2). Figure 3 shows the result following FEM calculation.

mechanical cause research in the event of injection moulding problems.

# ARBURG makes history

## 50 years of ALLROUNDER – five decades of top technology

**C**ast your mind back to 1961. A momentous year for the whole world – and for ARBURG. While Juri Gagarin was the first human in space, Karl Hehl developed the unique ALLROUNDER. The Russian cosmonaut thus conquered space travel at the same time as the Swabian inventor revolutionised the world of injection moulding. Five decades later, the innovative technology from the Black Forest has reached even greater heights.

During the past 50 years, technology has advanced at breathtaking speed, both in space travel and in injection moulding. Only eight years after Gagarin orbited the earth, the “Eagle” landing module touched down on the lunar surface and Neil Armstrong was the first person to step out onto the moon.

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### Progress conquers the world

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600 million people watched the event live on TV. In 1969, the engineering solutions from Lossburg also generated huge interest (albeit for a smaller audience) around the world. The 500th ARBURG injection moulding machine travelled around half the globe before it reached its final destination at a customer’s premises in Japan. This journey reflects ARBURG’s increasingly international focus. When the US space agency NASA launched the first

space shuttle in 1981, ARBURG was developing an ALLROUNDER for the processing of liquid silicone. Twenty years after the invention of the ALLROUNDER principle, its 25,000th injection moulding machine was produced.

In 2001, the ALLDRIVE was the first electric machine series introduced onto the market by ARBURG. During that same year, the European space agency ESA started its Aurora programme. Its mission is to explore the solar system and the red planet, Mars.

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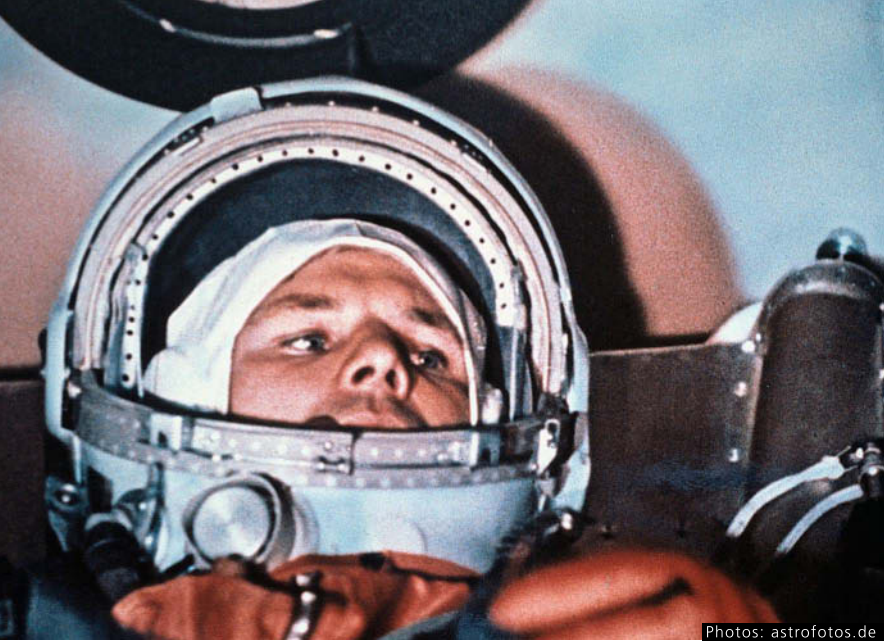
### Space shuttles land, ALLROUNDERS take off

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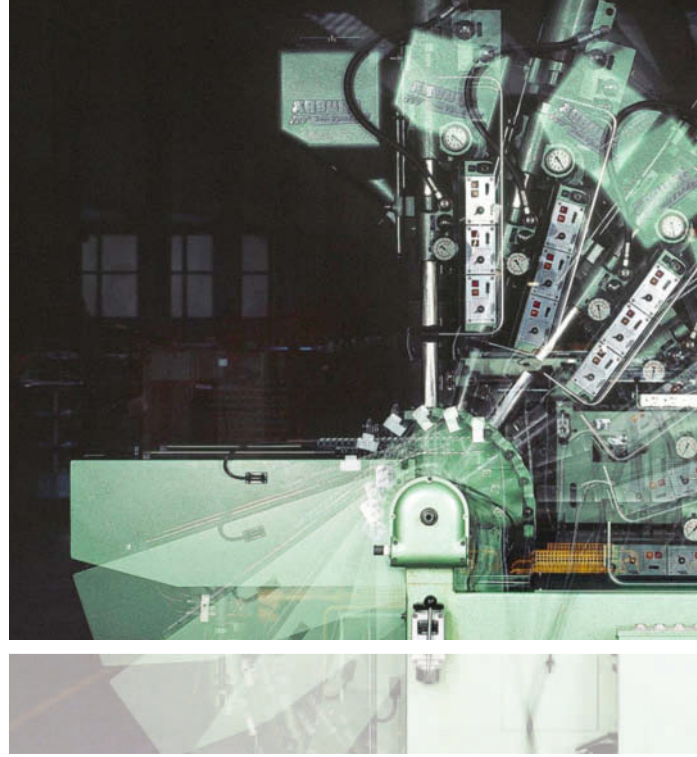
After 30 years, the Endeavour was the last space shuttle to the International Space Station (ISS). Scientists are searching for antimatter in space. ARBURG has developed the new electric EDRIVE machine series in order to promote energy-efficient injection moulding.

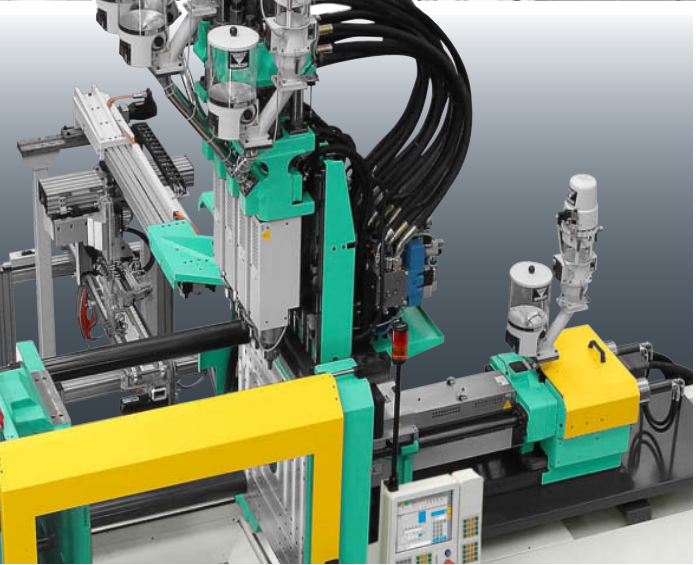
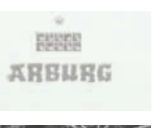
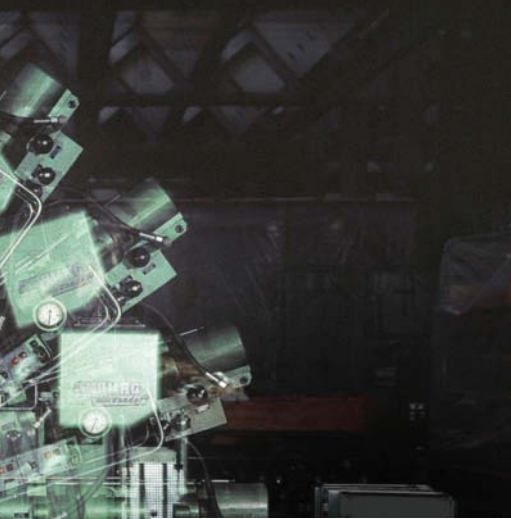
2061 – the distant future. Humanity will continue to seek out new worlds. A hundred years after its invention, the ALLROUNDER will no doubt also have reached new galaxies as yet unknown to injection moulders.

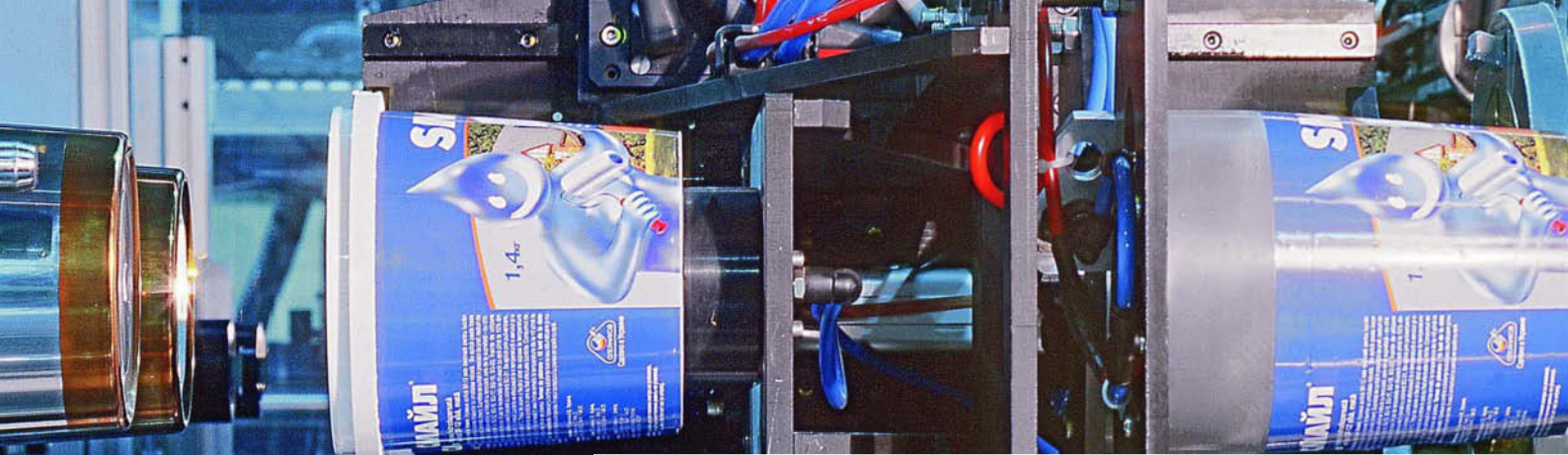




Photos: astrofotos.de



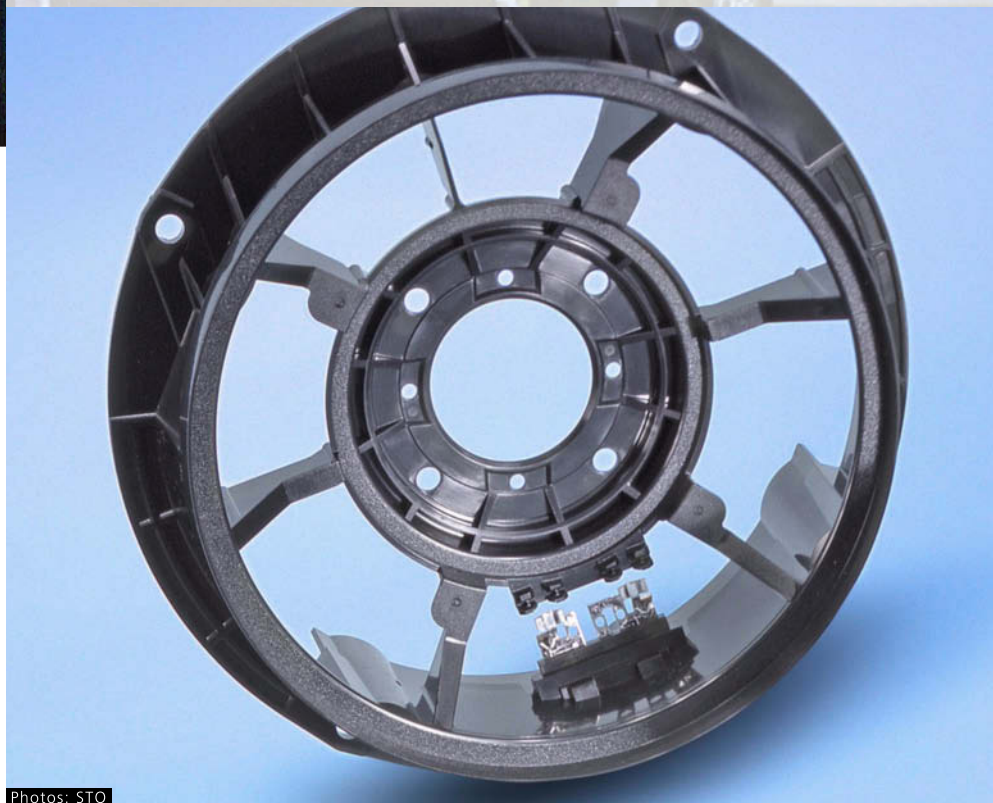




# Automatically

STO: High-end injection moulding technology

**A** plastics processing company with in-house mould construction and injection moulding shops, inter alia for medical technology, automotive and packaging items, which are produced in a highly automated manner, partly also using the IML process, as well as an in-house metalworking shop. A company with a high level of quality and processing, dynamic growth and comprehensive high-tech production. Its name: STO. Nothing unusual so far. The story becomes more interesting, however, when you know that STO is the abbreviation for Spetztekhosnastka Ltd. and that the company is based in Dneprodzerzhinsk in Eastern Ukraine.



Photos: STO

According to its own corporate slogan, STO produces "flawless quality" at "any level of complexity" and with "maximum punctuality". Following its beginnings as a casting mould manufacturer with rented machines and part-time workers in 1989, the company developed into an injection mould manufacturer in 1998 and integrated injection moulding production in 2002. In 2010, it was certified according to ISO 9001, ISO/TS 16949 and ISO 14001 and expanded its manufacturing capacity to include the production of technical

parts, before becoming the company with an excellent reputation worldwide that it is today.

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### Specialists for automotive and packaging

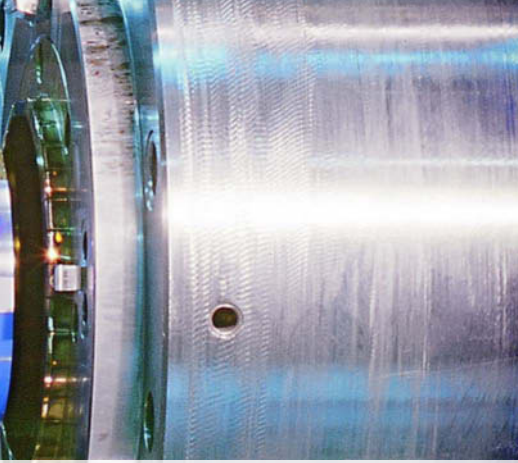
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In addition to OEMs for Western and Eastern European automotive manufacturers, STO's customers include RAVIV ACS Ltd. from Israel, Sonoco Crellin from the US, D&M Premium Sound Solutions from Belgium, as well as Leopold KOSTAL

GmbH & Co KG and Robert Bosch GmbH from Germany. Two hundred further Ukrainian customers trust in the extensive STO expertise with regard to the production of thin-walled packaging articles, i.e. in a sector which requires a high level of well-founded expertise.

The co-operation between ARBURG and STO dates back to 2004. Several hydraulic ALLROUNDER S and electric ALLROUNDER A machines were complemented by six hybrid ALLROUNDER H, two ALLROUNDER GOLDEN EDITION





# good!

## ogy from the Ukraine

STO relies on automated production for the production of thin-walled items (above) and frames for motor vehicle loudspeakers (centre).

models, as well as a project system with an integrated vertical MULTILIFT V robotic system in 2010 and 2011. Thus, a total of 16 ARBURG machines, which operate around the clock 24/7, have been integrated in the production facility.

### Automation is key

Of particular interest is the highly-automated ALLROUNDER 820 S with a

Owner Vladimir Lempert (right) and Operations Manager Stanislav Mienailo have ambitious goals which they intend to achieve with a high degree of dynamism in their company.



clamping force of 4,000 kN, a size 1,300 injection unit and a MULTILIFT V in cantilever design, which performs all the insertion and removal tasks. As a main contractor, ARBURG has assumed overall responsibility for implementation here. Loudspeaker housings made from PC/ABS with encapsulated metal connection pins are produced for VW. First, the pins are individually separated by hand and then, following visual inspection, inserted in pairs into four cassettes. These are picked up from a rotary table by the robotic system, which inserts them into the moving mould half. From here, the finished parts are removed via vacuum and set down on a conveyor belt system. During the encapsulation process, the MULTILIFT V fetches four new cassettes and waits for the mould to open again. Using integrated presence sensors, the four-cavity hot-runner mould, which is constructed in-house by STO and features pneumatic needle-type shut-off nozzles, checks that the individual cavities are occupied by the pin cassettes and that these are perfectly positioned.

Vladimir Lempert, founder and owner of STO, sees the technical equipment at his plant as having great potential for the future: "Currently, wage levels in the Ukraine are currently not so high, which means we can also still

produce many things manually. But the watchword for the future is certainly 'automation'. Here, it is customer demands that determine the moulds, machines, process speed and degree of automation employed. For us, ARBURG is the right partner in this respect. Not only do we receive the appropriate injection moulding technology, but also professional training, reliable service, fast technical assistance and flexible financing packages. On our evaluation scale, it receives an excellent eight out of ten possible points."

### INFOBOX

**Founded:** 1989 as a casting mould manufacturer

**Corporate divisions:** Packaging production with own brand name "Vital Plast", technical plastic parts for the medical technology and automotive sectors, mould construction and stamped parts production

**Employees:** 400, of which 120 at "Vital Plast" and 70 in mould construction

**Contact:** [www.d-sto.com](http://www.d-sto.com)

# Perfection is the goal

## International Service Managers attend training at Lossburg



ARBURG service managers from all over the world met in Lossburg for training and an exchange of views, e.g. on measuring energy requirements (left) and oil analysis (below).



Whichever country the participants came from, they all agreed that preventive servicing was the primary topic. The demand for service contracts is also increasing steadily. "Although these contracts have to be drawn up on a country-specific basis, we can benefit from the experience of our colleagues in countries where such contracts have long been established," explains Pawel Kucharczyk, who heads up the Service organisation in Poland.

**T**ime is money. Consequently, cycle times tend to be the central focus when it comes to increasing the efficiency of moulded part production. However, machine availability is also an important factor that should not be underestimated. This is precisely where ARBURG's worldwide service has been getting top marks for decades.

As the key contacts at the local level, service engineers are in demand on a daily basis and shoulder a high degree of responsibility. Their tasks involve not only solving problems as they arise, but also averting them in the first place, e.g. through preventive servicing, consulting and training for specialist personnel.

"Experience and knowledge are the key components in service. This combination saves our customers a lot of time and money," explains Service Manager Dietmar Müller from the US. That's why ARBURG does so much to improve the expertise of its service technicians on an ongoing basis, preparing them today for the challenges of tomorrow.

One example of the many activities undertaken by ARBURG is the meeting of international Service Managers held in May 2011. "In addition to the presentation of new products and service tools, increased networking represents an important factor for the future," summarises Visu Nagappa from Malaysia, speaking on behalf of the approximately 40 participants.

### Comprehensive pool of knowledge

Continuous global interaction with colleagues beyond the scope of the event creates an extensive pool of knowledge that places the expertise of each individual at the immediate disposal of his fellow service specialists. This is advantageous not only in day-to-day business, but also in dealings with internationally operating customers, for example, some of which need to relocate highly complex systems from one country to another.

### Gained in practice for use in practice

During the training event, oil analysis using particle counters and the correct measurement of energy consumption, both of which were demonstrated live attracted a great deal of interest. The programme was rounded off by individual discussions with ARBURG experts from various departments and specific training courses. "Our newly acquired knowledge will enable us to support our customers even more effectively and efficiently," agreed the service technicians unanimously. The next step is to hold national training courses for their employees to pass on the knowledge they have gained on a one-to-one basis and to help further improve service for customers worldwide.



# Automation from granule to hose

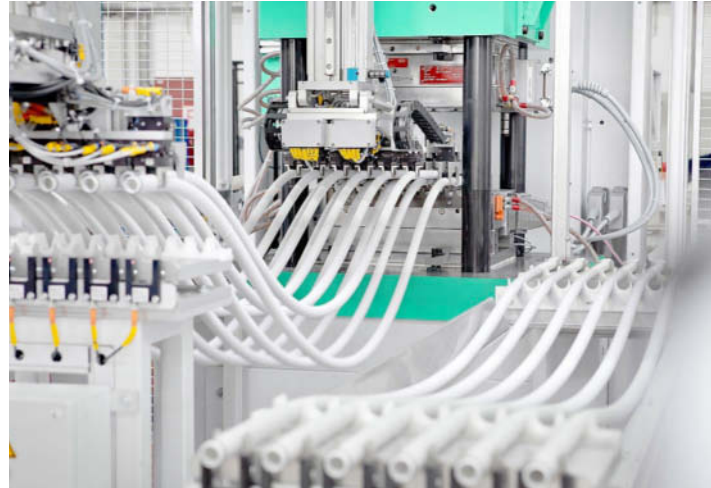
## Schlemmer: Extrusion and injection moulding in one process

**F**or its largest individual project to date, Schlemmer is relying on an ARBURG turnkey system. Inexpensive but high-quality hoses are being produced for a leading manufacturer of household goods. By combining extrusion and injection

moulding, flexible automated production is made possible without expensive intermediate storage.

"The ideal system is one where the plastic granulate is filled in at one end and ready-to-ship hoses come out at the other,"

says Roland Meißner, Division Manager Air & Fluid Systems at Schlemmer GmbH in Haßfurt. "This ensures consistently high quality round the clock." Schlemmer's core competency is in extruded automotive components. In 2009, the company expanded its activities to the white goods



sector. Schlemmer now produces hoses in high volumes for Germany's largest dishwasher manufacturer. In order to meet the high quality standards and deliver a complete, ready-to-install solution, extrusion has been combined with injection moulding.

"Our first criterion when selecting a suitable supplier was a turnkey system, as we wanted everything from a single source," explains Roland Meißner. "We wanted a single contact to provide a local service around the world. With ARBURG as a general contractor, we found that partner."

### Single-stage production brings cost advantages

For Schlemmer, the extrusion of a hose body and the injection of a fitting in a single process proved the most cost-effective solution. "Compared to two-stage production, the costs for intermediate storage are saved," says Project Manager Stefan Waldvogel. "This ALLROUNDER is our first vertical injection moulding machine. The fact that the entire system was commissioned after only eight months, including integration of the two processes and complete automation, bears witness to the excellent cooperation of

the project partners." In addition to ARBURG, the companies FPT Robotik (automation), Straberger (mould construction), Ohrmann (O-ring placement) and Furness Controls (leak testing) were involved.

What appeared to be a simple product at first glance soon revealed itself to be an engineering challenge.

### Robotic systems compensate for shrinkage during handling

"The extruded hose material cannot be handled when cold as so-called stress whitening occurs. The warm material, however, shrinks by several centimetres during the production process, which must be compensated for by the three robotic systems during handling," explains Process Technician Hubert Rausch. Moreover, about a dozen significant dimensions must be observed with regard to the hose body.

The first challenge was literally at the interface between extrusion and injection moulding. Here, by means of a cutting technique developed by



Satisfied faces at Schlemmer: Hubert Rausch, Roland Meißner and Stefan Waldvogel (left to right) have expertly combined extrusion and injection moulding for the production of hoses.

Schlemmer, the continuous PP material is cut to a precision of 0.1 mm. Reject parts are automatically removed via a photoelectric barrier. The OK parts are picked up by a four-axis robotic system from KUKA, which is characterised by fast and precise movements. This takes care of the most difficult task: the precise positioning of six hoses for the subsequent placement of the O-rings. Two synchronised FPT linear robots then grip



After cutting to length, (illustration on page 19) a four-axis robotic system transfers the hoses to an O-ring placement station (left). Two linear robots perform the subsequent handling (centre). A vertical ALLROUNDER injects the fitting (right).

Six finished hoses are produced in around 40 seconds in this manner.

the front and rear of the 2.25 metre-long flexible hoses.

### Cycle times and mould harmonised

In order to achieve the required annual unit volumes and to harmonise the cycle times of the two processes, the optimal mould was determined for the injection moulding process. Accordingly, the linear robots handle twelve parts in a single operation. First, they remove six hoses with the moulded-on TPE fitting and insert six new ones. The finished hoses are set down to cool in an intermediate station.

At the same time, the vertical ALLROUNDER with a clamping force of 1,000 kN, injects six more fittings in a cycle time of around 30 seconds. These later perform an adapter function. "Despite the progressive shrinkage a perfect join must be created between the hose body and fitting, without any over or under injection," explains Hubert Rausch. "In this respect, ARBURG and the mould manufacturer have contributed a lot of expertise. We're currently working on speeding up extrusion while also further reducing the injection moulding cycle time."

### Six hoses in around 35 seconds

The linear robots transfer the cooled

hoses to the next station, where they are consecutively subjected to leak testing. Reject parts are again removed and the other hoses are bundled into batches of 50 units. Six hoses pass simultaneously through the production cell in around 35 seconds.

The hose production system has been in operation since early 2011. The personnel were trained on site by ARBURG. Because the user interface of the SELOGICA machine control system has been implemented in the robotic control system, the machine and robots operate using one and the same control principle. Moreover, the two linear robots are combined in a single control system and are networked with the four-axis robotic system. Although the plant technology is highly complex, this allows production to be started with relative ease.

In order to keep the transport distances and costs as low as possible, production is located in close proximity to the customer in Romania. From here, the hoses can be quickly delivered to the dishwasher manufacturer's Eastern European production sites. In order to ensure smooth production around the clock, a maintenance contract has been concluded with ARBURG.

As a result of the positive experiences with the project, Schlemmer now operates three further ALLROUNDERS worldwide, with more planned.

## INFOBOX

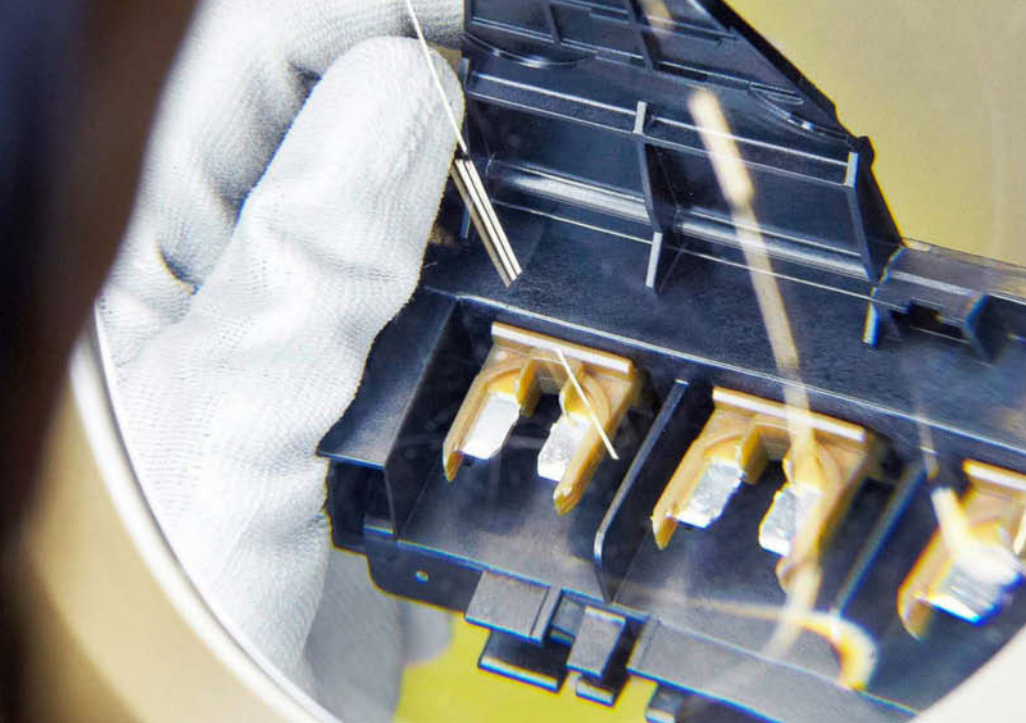
**Founded:** 1954

**Locations:** 18 production sites worldwide

**Employees:** approx. 1,400

**Products:** e.g. cable ducts, hoses, threaded fittings, sensors, solar absorbers, turning parts

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



# Everyday High-tech

## Söhnergroup: Technology



total of five manual operations can be dispensed with. The system will then be operated by a single employee and the others can be used more effectively to perform other tasks. Furthermore, two vertical injection moulding machines have been replaced by the fully automated production cell featuring a horizontal ALLROUNDER, which has considerably reduced the space requirements.

### Multi-component and insert technology in a single operation

**In many cases, cost-effective and high quality production is dependent on the advancement of automation in production. But not all types of automation are alike. Here, it is the complexity of the systems that makes the difference. Without exception, the production cells at Söhnergroup are high-end systems for extremely sophisticated production solutions which only very few other injection moulding companies venture to use.**

Costs and quality are decisive factors for many highly complex Söhner products. The company's products include electromechanical assemblies with integrated electronic components, composite parts made from plastic and metal, structural components, as well as purely plastic parts. "Here, it's a matter of developing and employing machine and automation technology in order to produce high quality, but also to do so as quickly and cost effectively as possible," says

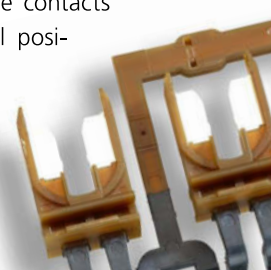
Jochen Neugart, Department Manager Plastics Process Technology regarding Söhnergroup's objectives.

### Cooperation with ARBURG has a long tradition

In order to comprehensively meet these high demands, Söhnergroup has placed its trust in a collaboration with ARBURG since the late 1960s, with both partners working together in a highly target-oriented manner. The latest project system also fits in perfectly with the Söhner philosophy. On a specially equipped multi-component ALLROUNDER 720 S featuring a Hekuma automation solution, contact strips for integration into an assembly used for motor vehicle transmission control are produced for Bosch. Currently, part handling between the individual processing stations is still performed by several operators. In the new production cell, these sequences in particular will be fully automated, so that a

Special requirements with regard to the components, which are submerged in transmission fluid, is their oil and temperature resistance, their bending resistance and their resistance to abraded matter in the oil, in order to prevent short circuits. For this reason, e.g. an EPTV is used as a soft component.

The production sequence is as follows: The metal contacts are separated and inserted into a 4-cavity mould, encapsulated with PA 6.6 and transferred via a robotic system. The robotic system then removes the pre-moulded part and transfers it to a station where the excess metal bridges are removed. The parts are then picked up again and inserted into the mould and encapsulated with the soft component. Next, the robotic systems removes the contact strip and transfers it to the next station where a short-circuit test is performed. Further downstream, the contacts are bent into their final position and permanently fused to the housing.



# ay business: ch solutions

## gy driver sets standards in automation

The finished assemblies are then removed, set down in trays and packaged. Only the provision of the packaging and removal of the packaged parts is performed manually. In 2011, around one million of these components are to be produced, with up to two million of the assemblies to be manufactured in the coming years.

### Delivery reliability and service

In addition to the technical specifications, ARBURG also excels in terms of the “soft” ancillary factors such as delivery reliability and service, according to Jochen Neugart. Currently, the procurement of further HIDRIVE machines is being considered, primarily due to their performance and then for price and energy-efficiency reasons, as Jochen Neugart emphasises.

“All our advances, for example in terms of energy-efficient production, ensure an excellent position for our customers in their respective markets. And this doesn’t only apply to Europe and the US,” says Bernd Schöffler, Production & Logistics Manager. “If we expand together with our large global customers, for example to China, they expect the same production standards to be maintained there too, because premium quality is valued in Suzhou just as much as it is here in Schwaigern.”



Efficiency is writ large at the Söhnergroup production plant (above). The production of contact strips (below) is soon to be automated. The strips are currently still being produced by several operators on two vertical machines (photos opposite).

### INFOBOX

**Locations:** Europe, North America and China

**Employees:** 1,300 throughout the world

**Industries:** Automotive, medical, manufacturing, packaging, energy, sanitary and household appliances

**Level of automation:** 85% of all machines, of which 25% with robotic systems and sprue pickers, 60% complete production cells

**Technology:** Multi-component, composite/insert technology, reel-to-reel, assembly, printing, stamping

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



# On the move...

## Mobile six-axis robotic system: relocation made easy

**A** six-axis robotic system with the guard and other peripherals on wheels? A robotic module that can be moved from machine to machine? That can be connected and quickly set up just where it's needed? Since the ARBURG Technology Days 2011, this type of robotic system is no longer a pipe dream. It provides significantly more flexibility in product planning and machine fleet utilisation.

A basic prerequisite for the mobility of six-axis robotic systems is a common and easy programming interface as is only available on the market with the SELOGICA user interface which can be implemented in the control

system of the KUKA robotic systems.

**Flexible applications: connect, set up mould entry – done!**

The operator can enter all the movement sequences and functions himself, on-site, without the need for a programming service. Beyond this, the mobile robotic modules only require a suitable interface for communication with the machine. The design of the modules is standardised. Consequently, the grippers can be changed easily.

What could a specific application for a mobile six-axis robot system look like in practice? If, for example there is a disruption in production, the mobile unit can

quickly be pushed from one machine to another and docked onto it. Once six-axis robotic systems become mobile, their daily use and consequently production planning become far more flexible.

During relocation of the robotic module, centrally stored ready-made sub-programs can be accessed. Only mould entry needs to be set up again. The robotic modules can be individually equipped to perform, for example, the set-down of moulded parts or downstream operations.

The high degree of freedom of a six-axis robotic system in automated production offers significant advantages and also makes it suitable for downstream production steps. The obvious move was therefore to eliminate the permanent



Relocation made easy: The compact module can be moved with ease (left). Innovative ideas: Completely new \* production cells can be created using several robotic modules (right).



attachment of the robotic system to the machine in favour of a modular, mobile alternative. For this purpose, only the connectors had to be detached. After removal of the feet and mounting of the rollers, the unit can be moved manually. The six-axis robot is suspended in the module and the complete control technology, including the manual control panel for independent programming is located within the guarding.

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### Completely new production cells

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Where several mobile robotic modules are available, completely new production cells can also be created through the integration of one or several injection moulding machines. Here, the parts can be removed from the injection moulding machine and set down. Moreover, intermediate steps for quality control, further processing, surface finishing or transfer to a second machine for encapsulation or final injection can also be implemented.

The possibilities are virtually endless as the set-up requirements during production changeovers are minimal.

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### Proven in practice

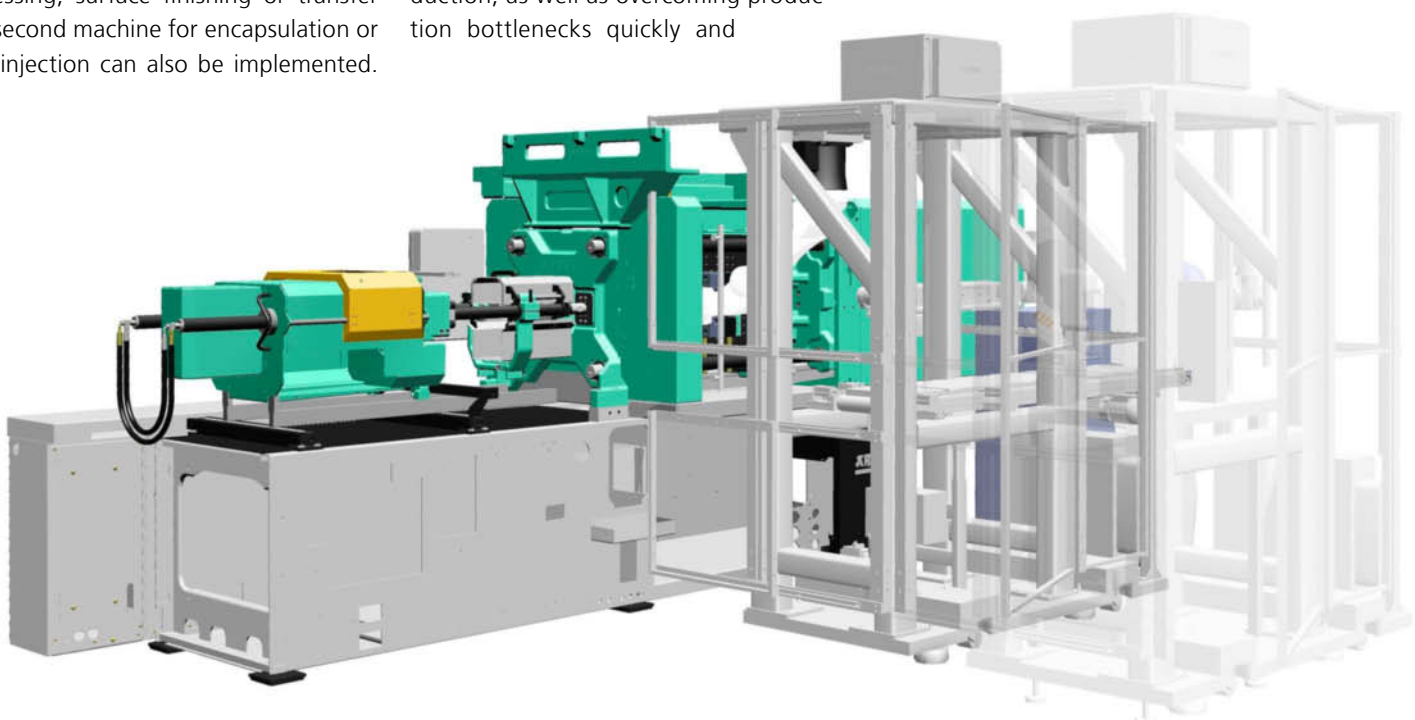
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The mobile robotic system concept was developed jointly with the provider of the idea, graduate engineer Michael Baum, Managing Director of Hohenloher Kunststofftechnik GmbH & Co. KG, who already has already implemented several of these mobile robotic system solutions. Here, it was technical production reasons that gave rise to realisation of the concept. Discussing the topic, Michael Baum said, "The ever increasing versatility of automation solutions shed a completely new light on both the actual capital expenditure on the technology and on its amortisation. Faultless production planning and continuous just-in-time production, as well as overcoming production bottlenecks quickly and

reliably, can be achieved to perfection with the flexible mobile six-axis robotic systems."



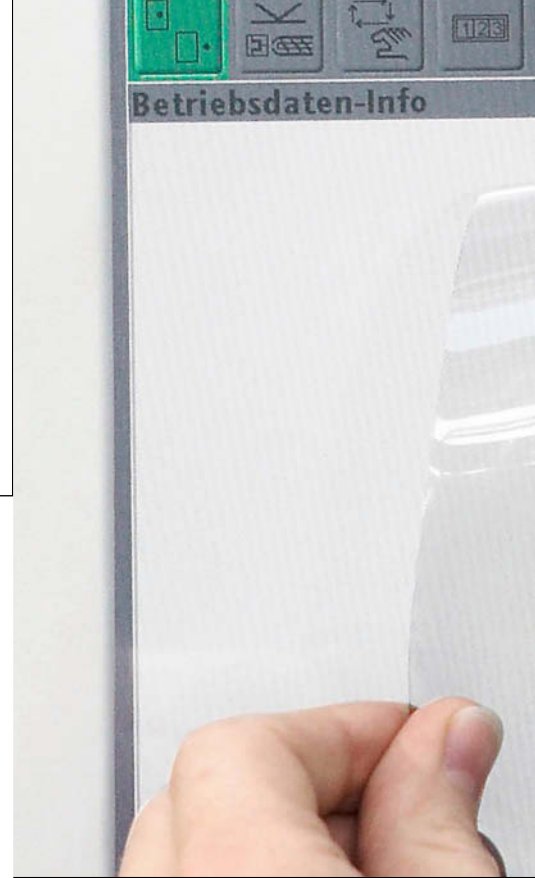
The film "Mobile six-axis robotic system" can be found on our YouTube channel ([www.youtube.com/user/ARBURGofficial](http://www.youtube.com/user/ARBURGofficial))





## TECH TALK

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



# Compression benefits

## Compression injection moulding – a process for many applications

**C**ompression injection moulding is used for the processing of virtually all plastic materials. When it comes to complex requirements with regard to moulded parts, high-quality serial production or high output production and consequently cost-effectiveness, compression injection moulding offers users numerous processing options to ensure that these are precisely met.

Compression injection moulding is characterised by a change in cavity volume during the ongoing injection and/or holding pressure phase. In practice, this means that the mould only closes completely once the melt is already in the cavity, or a ram is advanced inside the mould. A uniform pressure is thereby applied to the relevant cavity surface of the shrinking component. Ideally, there is a constant level of pressure within the cavity during the process. In terms of the machine, it is necessary to move the

injection unit and mould or mould components simultaneously. The mould, in turn, must be designed so that the cavity is sealed, even in the partially open state.

### Compression injection moulding offers many advantages

With compression injection moulding, greater flow path/wall thickness ratios can be achieved while shrinkage and deformation effects can be reduced. This leads to greater moulding precision, improved evenness and consequently higher part quality. A further benefit is that the internal stresses within the component and double refraction effects are reduced. This is particularly important for optical components. In the case of glass fibre reinforced thermoplastics, compression moulding ensures greater part strength. A further application example is the improved cavity venting during the injection moulding of thermosets or liquid silicones.

This prevents shrink holes and burn marks on the part surfaces. Moreover, compression injection moulding helps to eliminate sink marks and jetting. The latter is also relevant in the case of powder injection moulding. Furthermore, the low mould cavity pressure allows the use of smaller clamping units.

### Mould technology is decisive

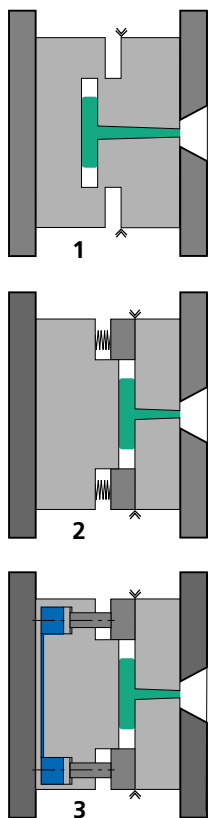
As a general rule, the design of the compression mould determines the machine-side compression function. In order to achieve a variable cavity volume, there are a number of possibilities. Based on the machine movements, a distinction is made between so-called "main axis compression" and "auxiliary axis compression". On an injection moulding machine, mould opening and closing as well as injection and dosage are referred to as "main axes". The "auxiliary axes" include ejection, core-pull functions and nozzle movement.



### Main axis compression moulding

Here, the compression movement is achieved via the clamping unit. The cavity can be sealed via a precision-machined flash face (1) or alternatively via an axially moveable compression frame (2-3). This frame already contacts the parting line before the mould is fully closed, sealing off the cavity to the outside.

The compression frame is pressed into position either by means of spring force (2) or hydraulically (3). Main axis compression moulding is primarily used for planar components with even wall thicknesses. Undercuts or openings perpendicular to the compression direction are problematic. Furthermore, mould concepts with compression frames also permit the compression of partial surfaces. Here, the buoyancy forces acting on the areas of the component which are not compressed must be absorbed by the compression frame. The pressing

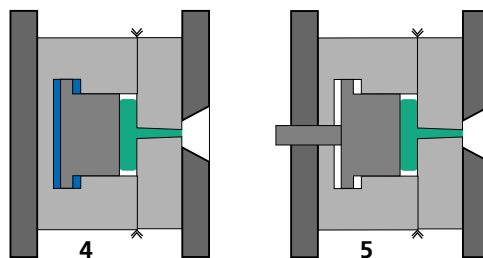


force generated via the spring or hydraulic action is significantly lower than the locking force. The process window during the compression of partial surfaces is therefore very restricted using the main axis.

### Auxiliary axis compression moulding

During auxiliary axis compression moulding, the buoyancy forces, in contrast, are absorbed by the locking force. This process is therefore particularly suitable for the compression of partial surfaces. Here, the compression movement takes place within the cavity via a ram. The core-pull functions (4) or the ejector (5) are used for this purpose.

Compression via the clamping unit,



however provides the advantage of power reserves which are ten times higher than during compression via rams inside the mould. The precision that can be achieved depends largely on the

Compression moulding prevents internal stresses in the component. These can be verified directly in the SELOGICA control system using polarising film.

repeat accuracy of the compression movement, and consequently also of the clamping unit. The next issue of today will provide more information on this topic.



**Customised series production.** Milestones of the ALLROUNDER principle: Variety of working positions. Multi-component injection moulding. Modularity. Automation. VARIO principle. Displaceable injection unit. Vertical and rotary table ALLROUNDERS. SELOGICA machine control system. Today: Unique range of technologies. Highly modular. Customised to meet any production requirements. The ALLROUNDER: 50 years of innovation. To be continued...



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