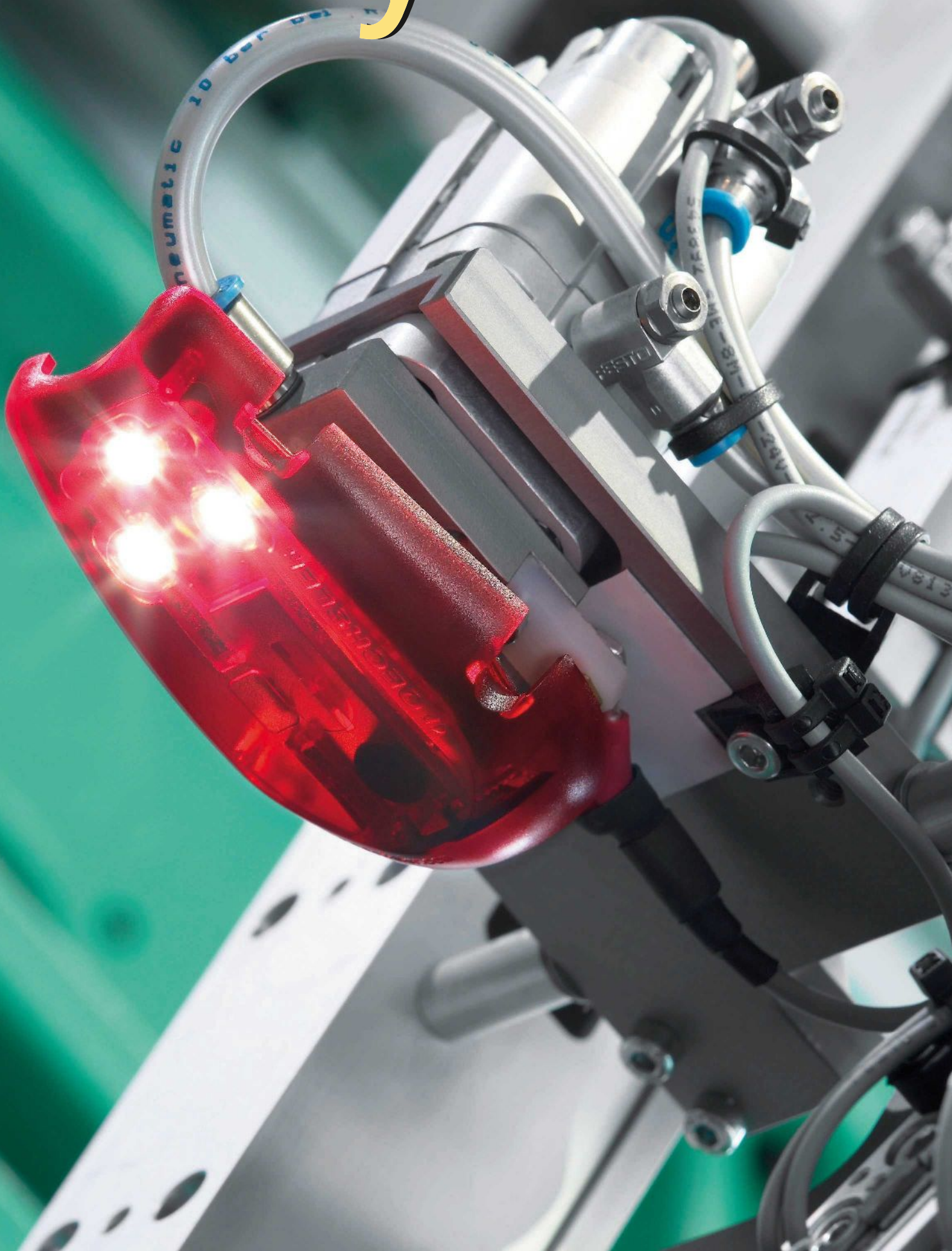


# today

The ARBURG Magazine

Issue 37

2008



<b>4</b>	<b>Customer report</b> ENGIMICS: Turbine cores, Swiss Made
<b>6</b>	<b>Product</b> MULTILIFT V SELECT: Learning step-by-step
<b>7</b>	<b>Product</b> Talking about host computers
<b>8</b>	<b>Customer report</b> Rudolf Michael: Coil shells of all kinds
<b>10</b>	<b>Service</b> Oil management counts
<b>12</b>	<b>Service</b> Assuring quality
<b>13</b>	<b>Our company</b> Double celebration in Denmark
<b>14</b>	<b>Our company</b> Two new ATCs for USA
<b>15</b>	<b>Our company</b> ARBURG now in Mexico
<b>16</b>	<b>Customer report</b> XRAY: Small-scale racers
<b>18</b>	<b>Our company</b> Training: Investment in the future
<b>20</b>	<b>Project</b> Kongsberg Automotive: Automated automotive
<b>22</b>	<b>Tech talk</b> Energy-efficient design



## MASTHEAD

### today, the ARBURG magazine, issue 37/2008

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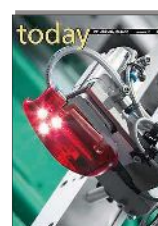
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Jointly with Oechsler AG, ARBURG demonstrated a future trend with the manufacture of a fully-functional LED light strip in a single production step at the K 2007.

**ARBURG**



## Dear Readers,

First things first: we are very happy with how the year 2007 has gone. ARBURG was able to continue proving itself as a reliable partner in the industry, and even considerably expand its volume of business.

Of course, our successful presence at the K 2007, the leading international trade fair in Düsseldorf, was a major highlight. One of our most important exhibits was the fully automated production of an LED light strip, which you can see on the title page. This process, which greatly impressed global injection moulding circles, was made possible by the use of a special, conductive plastic and the encapsulation of the highly sensitive LED component.

With this application, achieved in collaboration with Oechsler AG, ARBURG was again able to demonstrate its power of innovation and present itself as a strong partner for the future: a partner who, over decades, has

displayed stability, continuity and solid growth. You can rely on ARBURG - all around the world.

Consequently, in 2007 we also intensified the internationalisation of our company. Our aim is to further improve customer proximity and the high quality of our customer support around the world, and to bring our service offer up to the level of Lossburg. This process is assisted by the increased exchange of information between employees and the transfer of know-how between the head office and the subsidiaries. You will find key examples of investments in the global sales and service network in the USA, Mexico and Denmark in this issue of "today" .

We hope you enjoy reading this new issue.

Helmut Heinson  
Managing Director Sales

# Turbine cores,



Photos: ENGIMICS SA

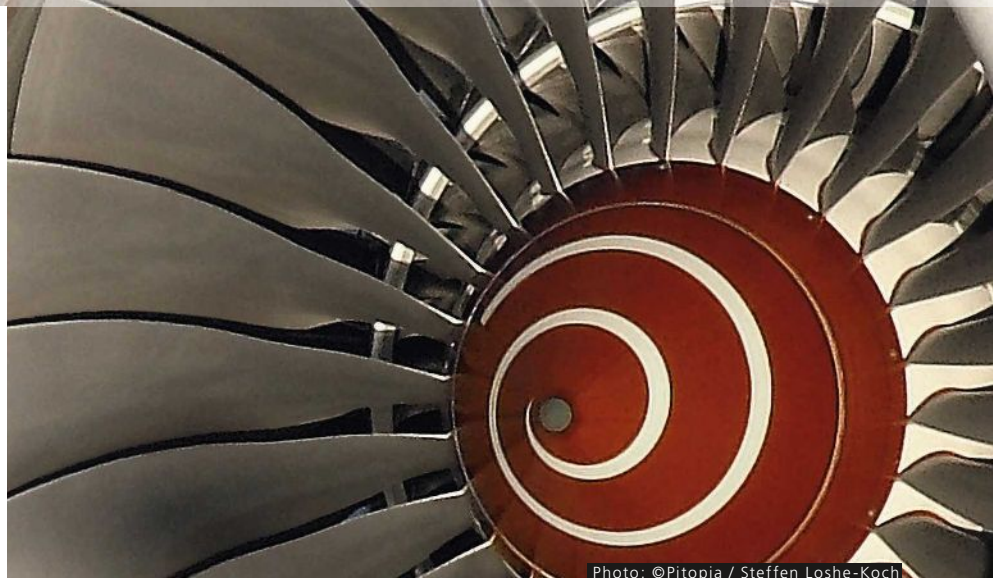


Photo: ©Pitopia / Steffen Loshe-Koch

**W**hen Swiss Made and Made in Germany work jointly on the production of moulded parts, the only possible result is extremely high precision and high quality technical parts. The Swiss company ENGIMICS SA makes use of a specially configured vertical ALLROUNDER 630 C to manufacture ceramic cores in a powder injection moulding (PIM) process. These, in turn are used in the manufacture of gas turbine blades.

ENGIMICS SA can best be described as a start-up company. Its foundation, in Novazzano/Ticino, dates back only to July 2005. Starting out with four employees, the company now has ten, who manage the high-tech manufacturing processes in a production area with a floorspace of 1,400 square metres. The company is still growing, and market developments are very positive.

ENGIMICS produces around 12,000 of

the highly complex ceramic cores annually, achieving a sales volume of some 1.3 million euros. In this context, a look at the market that the company serves proves revealing. ENGIMICS customers come from the manufacturing industry, who in turn supply OEMs as well as the operators of gas turbine power stations. Both gas turbines for power generation and for aircraft engines are high-tech power units, which are produced almost exclusively in industrial countries with a high level of technical expertise.

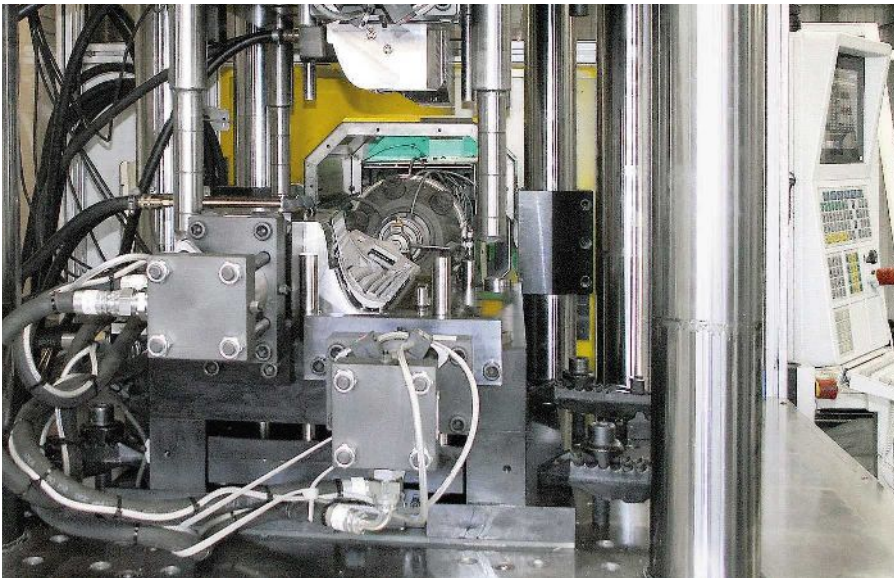
The main component of these turbines is the turbine blades, which are subjected to extremely high temperatures. For this reason, the blades must be intensively cooled. An important process step during their production is the inclusion of cooling channels inside the blades. This is where the ceramic cores, which are manufactured by ENGIMICS from silicon oxide ceramics in the

PIM or CIM process, come into play. The main selling market for ENGIMICS products is currently the Swiss precision casting industry, whose customers, the turbine manufacturers, are principally based in Europe and the USA.

The first contact between ENGIMICS and ARBURG dates back to the company's founding year, 2005. The ALLROUNDER 630 C with a clamping force of 2,500 kN and size 1300 injection unit employed to produce the ceramic cores is equipped with some special features that have been adapted for use in the ENGIMICS production environment. The machine's clamping unit opens vertically upwards so that the green components lie freely accessible on the lower part of the mould, from where



# Swiss Made



The ceramic cores (photo, bottom left) are manufactured on a specially configured ALLROUNDER 630 C (photo, left). The machine's clamping unit opens vertically upwards so that the finished green components lie freely accessible on the lower part of the mould (photo, right).

they can easily be picked up. The injection unit is designed to be highly wear resistant, the cylinder is made from high-chromium, powder-metallurgically produced steel (BMA), the screw consists entirely of powder-metallurgically produced, hardened steel.

Ceramic cores with a length of up to 700 millimetres and a weight of 2,000 grams can be produced using this ALLROUNDER configuration, which runs in single-shift operation at ENGIMICS. A typical product is cores with a length of 400 millimetres and thicknesses between 0.6 and 20 millimetres for use in gas turbines made by General Electric, for example. Powers of up to 200 megawatts can be generated using these turbines.

Three connections for hydraulic mould slides and six temperature control device interfaces are necessary for the single-cavity mould and reliable demoulding of the complex ceramic cores. Automatic ejectors lift the filigree, not yet fully hardened

core out of the concave mould side. The green components are then debinded and sintered, after which they achieve their final size and strength.

According to ENGIMICS, co-operation with ARBURG runs very smoothly because as a machine manufacturer, ARBURG reacts very flexibly to the company's requirements, "We are thoroughly satisfied with the ALLROUNDER machine technology. Maintenance is carried out in accordance with an inspection contract. With this sophisticated injection moulding technology, we can ensure optimum dimensional stability of our components. In future, we would also like to set up programme and data management via PC. Consequently, there is plenty of scope for further co-operation between "Swiss Made" and "Made in Germany".

## INFOBOX

**Founded:** July 2005  
**Location:** Ticino, Switzerland  
**Production area:** 1,400 square metres  
**Employees:** Ten  
**Products:** Ceramic cores for the production of turbine blades using the PIM injection moulding process  
**Contact:** ENGIMICS SA,  
 Via Roncaglia 20,  
 Casella postale 104,  
 6883 Novazzano/TI, Switzerland



# Learning step-by-step

**Step-by-step, intelligent robotic systems can “learn” the positions they are to move to in order to pick up and set down parts with the highest precision. A teach-in function of this type is now also available for ARBURG’s MULTILIFT V SELECT robotic system via the SELOGICA ‘direct’ control system.**

The MULTILIFT V SELECT, which was introduced onto the market at the K 2007, is a newly configured servo-electric robotic system that is competitively priced thanks to a set of pre-defined features. A suitable MULTILIFT V SELECT is available for each machine size of the ALLROUNDER A and S (270 upwards). The introduction of this basic robotic system responded to customers’ wishes for a simple programming solution - ideally without the need for specialised programming knowledge. Consequently, the new teach-in function is now available on the MULTILIFT V SELECT.

But how exactly does this enable the robotic system to become more “intelligent”, when in many cases the operator knows the movement sequence of the robotic system - for part removal, for example - but is unfamiliar with the programming options.

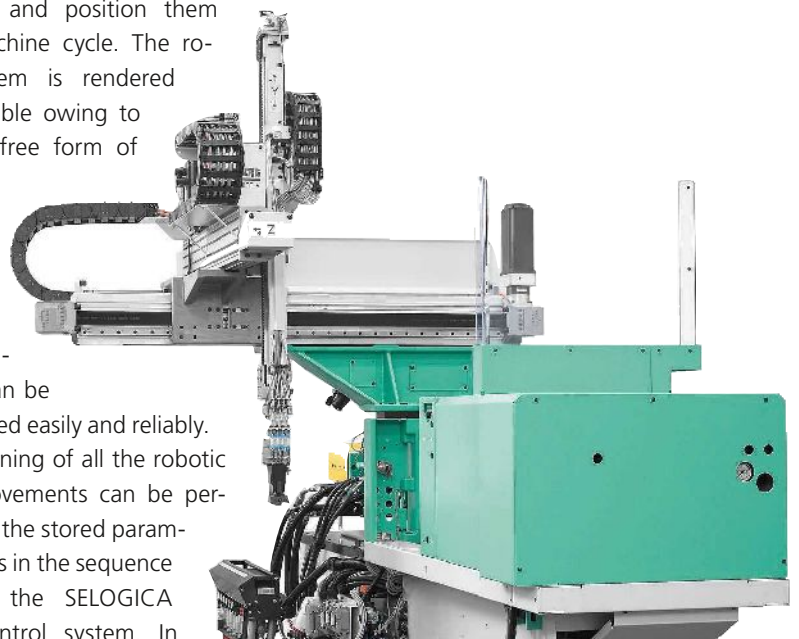
In the so-called “Teach mode”, all the positions of the robotic system are moved to manually in succession. The various

positions are simply confirmed via the “Teach” button. All the necessary parameter entries are then performed automatically in the control system. Simultaneously, SELOGICA ‘direct’ independently generates the robotic sequence and integrates it into the machine cycle. The last-entered position can be cancelled via an “undo” function, in order to quickly reverse incorrect programming.

The new teach-in function makes the programming of robotic systems easier thanks to its intuitive operating options. Installation technicians and machine operators can easily create robotic sequences and position them in the machine cycle. The robotic system is rendered highly flexible owing to this new, free form of programming. All the individual removal sequences can be implemented easily and reliably. The fine tuning of all the robotic system movements can be performed via the stored parameter screens in the sequence editor of the SELOGICA ‘direct’ control system. In

With the teach-in function, the MULTILIFT V SELECT robotic system easily finds its way.

future, the teach-in function will also be available on all other MULTILIFT robotic systems.





Julian Kremer (right in photo) discusses customer-specific requirements for the ARBURG host computer system (ALS) with Michael Vieth, ARBURG Control Technology.

# Talking about host computers

**T**he 'today' editorial team asked Julian Kremer of Kremer-Kautschuk-Kunststoff GmbH & Co. KG for an interview on the subject of the ARBURG host computer system (ALS). As a student of plastics technology and assistant to his father's corporate management team, Julian Kremer combines experience of the system from both the research and business perspectives. Kremer-Kautschuk-Kunststoff's investment in the host computer system also took advantage of ARBURG's current ALS promotional offer.

**today:** Mr Kremer, you introduced ALS in your company in January 2008 and will be progressively expanding it up until March. What were your expectations?

**Kremer:** Of primary importance to us was to ensure the continuity of product quality in the future. With ALS, changes can be reliably managed through the centralised recording and archiving of the settings data. We also had to ensure that our production planning is based on the current data and that long-term changes are taken into account. The current promotional offer is attractively priced, and the modules it comprises are very useful in terms of our requirements. So it was an easy decision.

**today:** How did you find out about ALS?

**Kremer:** At the Darmstadt University of Applied Sciences, we work with an ALLROUNDER 320 S at the laboratory. Here, we needed to be able to work in a rapid and simple manner with the recorded process parameters and the set-up log. ALS seemed the obvious solution. In consultation with ARBURG, implementation was also straightforward for our students.

**today:** You have experience both from the academic and business worlds. What are the benefits of a host computer system in modern injection moulding production?

**Kremer:** A high degree of reproducibility is required on a shot-to-shot basis on the one hand, which must be ensured by the machine control system, and from one order to the next, on the other hand, whereby ALS makes a valuable contribution to in-house organisation. Reliability and 100 per cent availability of the process data is assured long term thanks to centralised data management.

**today:** In a nutshell, what are the three main arguments for investing in ALS?



**Kremer:** Firstly, transparency and clarity, secondly, increased product quality and thirdly, reduction in down time and increased productivity.

## INFOBOX

- Founded:** 1958, in family ownership ever since
- Employees:** around 80
- Products:** Moulded rubber, plastic and LSR parts for the automotive, machine and electrical industries
- Contact:** Kremer-Kautschuk-Kunststoff GmbH & Co. KG, Formteile und Systeme, Hans-Streif-Straße 2-6, 63628 Bad Soden-Salmünster, Germany, [www.kremer.de](http://www.kremer.de)



# Coil shells of



**F**or many decades now, Rudolf Michael GmbH has produced a wide variety of coil shells and has a high level of expertise in this sector. This expertise is appreciated not only by customers from Germany and Europe, but also from Asia and the USA. In addition to the standard products, of which there are some 15,000 different versions, their range also includes customer-specific coil shells. Insulation products and technical moulded parts complete their product portfolio.

Owing to the product range, a large proportion of Michael customers are from the electrical and electronics industries. After all, the coil shells are used in many different sectors. "Our coil shells can be found wherever electrical current flows, from small transformers right up to transformers for the shipping sector,"

says Technical Director Wolfgang Michael. He demonstrates the breadth of the company's range of products by comparing an extremely thin-walled component with a thickness of approx. 0.3 millimetres to a coil shell weighing more than 800 grams for transformers.

Around 60 per cent of the products are supplied to German customers, the remaining 40 per cent are destined for export markets. "The European countries are the most strongly represented in terms of exports. However, we also supply to China and the USA," explains Commercial Director Dr. Uwe Schikora proudly.

This testifies to their high product quality, which stems not least from the family business's many decades of experience. Its success story began in 1912 in Thuringia, where coil shells and insulation components were manufactured using the compression moulding process. The foundations for the current factory in the centre of Eppingen were laid by Rudolf Michael in 1949.

The progressive move into modern injection moulding began with the purchase of the first ARBURG machines in the mid 1950s. In the early days, the injection moulded machines were even personally collected by van from Lossburg. This relationship of trust between the two companies endures to this day and is demonstrated by the fact that Michael personnel regularly attend ARBURG training courses in Lossburg in

order to further expand their expertise.

This strategy is also reflected in the injection moulding machines: In order to keep their production facilities up-to-date, ongoing investments are made in technically and economically more advanced ALLROUNDERS. The company's extensive machine line up includes injection moulding machines with clamping



forces from 350 to 2,100 kN, nearly all of which have been supplied by ARBURG.

The ALLROUNDERS are adapted in line with the company's requirements. For the production of coil shells with encapsulated pins, for example, the machines feature four core pulls.

The wire, which is provided on reels, is fed automatically and cut in the mould itself to form the pins. Because the wire feed is horizontal, injection is performed into the parting line via vertically arranged injection units. Extremely precise posi-



# MICHAEL SPULENKÖRPER

## all kinds

tioning of the metal pins must be guaranteed, because the moulded parts are usually further processed by customers fully automatically. For this product segment, the company uses a production cell built around an ALLROUNDER 370 C with a MULTILIFT H robotic system, which has been designed in co-operation with the ARBURG project department.

Owing to the broad range of parts, the machines require frequent conversion. Unproductive machine conversion time is kept to a minimum by means of optimum production planning. The moulds are largely produced at the in-house mould-making shop, which is also responsible for repairs and regular maintenance of the moulds. In view of the extensive quality requirements, this department plays a key role, not least because glass-fibre reinforced plastics with highly abrasive properties are processed.

A look behind the scenes at Rudolf Michael GmbH, which has an overall floor-space of around 6,500 square metres, reveals a clearly structured and well co-ordinated workflow. This ends in an extensive warehouse stocking system which allows just-in-time delivery.

A further benefit of this warehouse storage system is that production can be flexibly and rapidly converted to cater for special custom-



er requests without incurring the risk of bottlenecks. The standard coil shell range is supplied from stock and can also be requested or ordered via the Internet.

The current two-shift production can be extended to three shifts at any time in order to meet delivery deadlines during peak order periods. The Eppingen-based company is consequently well-equipped for the future.

"We see ourselves as a thoroughly conservative, yet innovative company, which can succeed on the market by virtue of low personnel turnover, little know-how drain and high quality specialist products," says Technical Director Wolfgang Michael, summarising the corporate concept.

It is not only standard components that are produced using ALLROUNDERS at Eppingen, but also customised coil shells and technical injection moulded parts.

### INFOBOX

**Founded:** 1949 by Rudolf Michael in Eppingen, (originally founded by Kurt Michael in Steinach/Thuringia in 1912)

**Employees:** currently 80, of which four trainees on average

**Products:** Coil shells of all types and sizes, customer-specific moulded parts, encapsulating caps, lateral insulators, soldering connections, various accessory parts

**Customers:** Transformer production, electrical and domestic appliances, electronics, medical technology and machine construction sectors

**Machine fleet:** ALLROUNDER injection moulding machines from 250 to 1,600 kN

**Contact:** Rudolf Michael GmbH, Bahnhofstr. 30, 75031 Eppingen, Germany, [www.michael-spulen.de](http://www.michael-spulen.de)

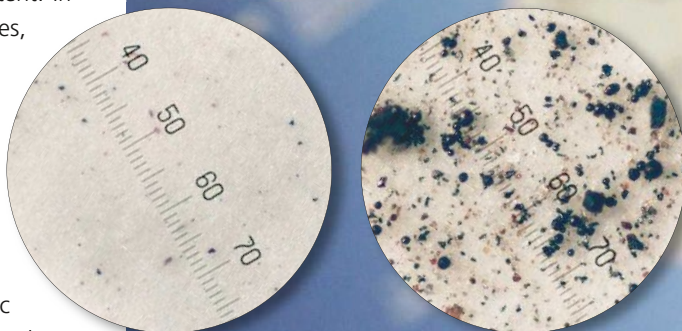


# Oil manage

**I**n addition to improper maintenance, contaminated hydraulic oil is one of the principal causes of faults in injection moulding machines. In 70 to 90 per cent of cases, damage to hydraulic components is attributable to contamination in the hydraulic system. The goal of oil management is to prevent contamination of this kind in order to enhance the availability, reliability and therefore the efficiency of injection moulding machines. Oil management is not restricted to the end user, it also involves the manufacturer of the injection moulding machine.

Hydraulic oils can become contaminated through air, water or solid particles. It is contamination by solid matter that is the primary cause of significant surface damage to hydraulic components through wear mechanisms such as abrasion. The consequences are control inaccuracies, leaks, losses in efficiency and a shorter service life of components. More and more particles penetrate into the hydraulic oil and wear is further increased. Even filter systems can only interrupt this chain reaction of wear to a limited extent. In addition to the number of particles, their size also has a decisive influence on wear. The wear-inducing particles are so small that they cannot be detected by the naked eye.

In order to achieve a reproducible classification of particulate contamination in hydraulic oils, several standardised methods of analysis are available. The international





# ment counts



ISO 4406:1999 standard is widely used, in which the number of particles larger than four, six and fourteen microns respectively is determined and assigned to a defined characteristic value. In practice, automatic particle counters are normally used for this purpose. The purity of a hydraulic oil can thus be assessed very quickly and simply. It should be noted that the increase of a characteristic value by a factor of one represents a doubling of the number of particles.

But how do hydraulic oils become contaminated in the first place? First of all, a lack of cleanliness with regard to components during assembly is worthy of mention. This so-called original or initial contamination of the hydraulic system can have a decisive effect on the reliability of an injection moulding machine. As a rule, the lower the degree of original contami-

nation, the more wear-free the hydraulic system will initially be. Consequently, oil management always begins with the manufacturer.

A further important source of contamination is the hydraulic oil itself. The required purity class of the oil is determined by the hydraulic system: The higher the performance requirement of the parts used, the greater the demands. ALLROUNDERS require purity class ISO 18/15/12. Conventional drum oil does not meet this standard.

The seriousness with which ARBURG regards the subject of oil management can be seen in all areas of production. Prior to assembly, for example, cast parts such as the housing or cylinder covers are freed of soiling in so-called "washing machines". Once cleaned, all the components are kept in closed boxes or under protective film until they are installed. A similar procedure applies to the hydraulic pipes and hoses, which are rinsed out and then protected from soiling by means of plugs. ARBURG also commissions all the injection moulding machines before they leave the factory. The purity class of the hydraulic oil used for this purpose is regularly monitored and is significantly above the requirements. The oil tank is vacuum evacuated following commissioning.

All these efforts on the part of ARBURG would however be nullified without the end user's co-operation. For example, if hydraulic oils that do not comply with the specified purity class are used in ALLROUNDER machines. Proper storage of the hydraulic oils is decisive in order to maintain their purity class. Hydraulic oils should also always be filled via a micro-filter unit. If these measures

Cleanliness is a priority at ARBURG: for example, components are kept in closed boxes until assembly (photo, top left), and the oil tank is vacuum evacuated prior to delivery (photo, top right). The oil tank should always be filled via micro-filter units (photo, centre). Microscopic photographs (bottom left: Pall Corporation) clearly demonstrate the differences in quality of hydraulic oils (ISO 18/15/12 and 21/20/17).

are not observed, contamination of the hydraulic system will automatically occur. In this case, preliminary damage and even the premature failure of hydraulic components is virtually pre-programmed. The final step in effective oil management is the regular performance of oil condition analyses. These permit the reliable detection of unusual contamination of the hydraulic oil. Conclusions can therefore be drawn with regard to wear on pumps and seals, for example.

# 120



## Assuring quality



**C**apability validation serves to assess machines and production processes with regard to quality considerations. But in the field of injection moulding, in particular, opinions can differ widely as to what machine and process capability ultimately mean. Clear definitions are therefore vital for all concerned.

The quality capability of an injection moulding machine depends primarily on the precise operation of its measurement and control systems. This can be ensured through the calibration of all quality-relevant machine parameters during dry runs, i.e. operation without mould or material. Calibration of this type is performed on every ALLROUNDER prior to delivery. However, because machine parameters may change over time, for example through wear, regular re-calibration is necessary.

Only in this way can the reproducibility of an injection moulding machine be maintained. ARBURG offers inspection contracts for this purpose.

A quality-capable injection moulding machine is the first prerequisite for ensuring moulded part quality. But parameter settings, the mould, cooling, temperature control as well as the material, operator and environmental conditions also have an influence on moulded part quality. In order to prove the process capability of an injection moulding machine, moulded parts must therefore also be produced and specified characteristics and tolerances checked.

Process capability is divided into two stages, depending on the environmental conditions and the timeframe of the investigation. The first stage is so-called short-term capability, in which only a small number of consecutively produced moulded parts are examined. Due to the short testing period, influences owing to material, operator and environment remain virtually constant. The result therefore permits a basic statement on the quality capability of the production facility and is consequently referred to as 'machine capability'. Machine capability is usually verified during acceptance testing at the factory using the customer's mould and materials. If customers so wish, ARBURG can provide assistance in the determina-

The calibration of injection moulding machines is based on guidelines produced by the VDMA (German Engineering Federation).

tion of tolerances and the statistical analysis of individual process parameters.

Statements on the actual process capability, however, can only be made once quality capability is examined under real process conditions. Tests of this kind must necessarily be performed on site and over an extended period, so that influencing factors such as the material, operator and environment can take effect. Here, the ARBURG quality assurance system AQS can provide assistance.



## Double celebration in Denmark



Photos: Hjuler Mikael



**In 2007, the Danish subsidiary, ARBURG A/S, had two reasons to celebrate: on the one hand, their ten-year anniversary, and on the other, their relocation to new premises in Greve.**

These two events were marked in style with a two-day celebration. On the first day, ARBURG Partners Eugen, Juliane and Michael Hehl were in Greve, with invited guests in attendance, to officially open the new premises and to congratulate Subsidiary Manager Eddie Oswald and his team on the ten-year anniversary. The following day, numerous visitors attended the open day to view the new premises.

In his speech, Michael Hehl, Managing Partner and Spokesperson for the ARBURG Management, stressed the importance of customers for ARBURG: "The customer was, is, and remains our most important

capital. Customer proximity and customer satisfaction have always been our highest priorities.

In terms of customer proximity, the new Greve site is strategically well-located and easily accessible for both our customers and our personnel. Over an area of 350 square metres, we have modern offices, a well-stocked spare parts store and a demonstration room offering sufficient space for four ALLROUNDERS. Besides acting as a forum for showcasing our products, the demonstration room also serves as a place where customers can, for example, try out new moulds or receive practical help in dealing with typical everyday injection moulding problems.

A modern training room has also been integrated in the demonstration area in order to offer practical customer training courses in Greve. On viewing the new premises, all visitors were highly im-

Eddie Oswald (photo, bottom right) welcomes visitors to the new premises in Greve (photos, centre). For the ceremonial inauguration, he cut the official ribbon together with Juliane, Michael and Eugen Hehl (photo, top, from left to right).

pressed with the new facilities available at the Greve site.



# Two new ATCs for USA



Subsidiary Manager Friedrich Kanz (left) explains the diverse service offer of ATC Midwest at the grand opening in October 2007 (photo, bottom). The official opening of the ATC California in February 2008 (photo, top).

**C**ustomer proximity and comprehensive customer service have traditionally been top priorities for ARBURG. This is evidenced by the two new ARBURG Technology Centers (ATC) in the USA. Both the ATC Midwest and the ATC California feature a demonstration room with ample space for presenting the current ALLROUNDER range.

In order to provide a professional service to customers in the USA, ARBURG has invested in two new Technology Centers. While the ATC Midwest, located in Elgin, Illinois, is the contact point for existing and potential customers in the Midwest of the USA, the ATC California is responsible for covering the Westcoast Together with the Headquarters in Newington, Connecticut, the US Subsidiary ARBURG Inc. is therefore well equipped to offer its services.

The new ATCs are specifically aimed at providing training courses and application



engineering support, performing machine presentations and mould sampling, as well as a guaranteeing a complete after-sales service - all at one location in close proximity to the customers.

At the heart of both Technology Centers is the demonstration room, which offers sufficient space for six injection moulding machines from the micro injection moulding machine with a clamping force of 125 kN right up to the largest ALLROUNDER with a clamping force of 5,000 kN.

As well as this investment in the new ATCs, the range of services has been

further expanded in the USA. Owing to the increasing demand for complex project systems, the ARBURG Inc. team has been joined by an expert, who provides an automation consultancy service for American customers and implements customised production cells in collaboration with the ARBURG project department.



Photo: Digital Vision

# ARBURG now in Mexico

**S**ince 1 January 2008, ARBURG is now represented in Mexico by its own subsidiary, ARBURG S.A. de C.V. This gives due recognition to the enormous potential of the Mexican market. This move is partly the result of the increased presence of international global players who are stepping up their production in Mexico, as well as the ever-higher quality demands made by Mexican customers.

In order to support these companies in line with ARBURG's high quality standards, a strong sales and service organisation is required. ARBURG S.A. de C.V. is set to continue and build on the successful work of our trading partner IPLYH and to further enhance ARBURG's presence and proximity to customers. The new ARBURG subsidiary will present itself to the public for the first time at the Plasti-magen, which will be held in Mexico City from 8 to 11 April 2008.

The changeover will take place seamlessly for ARBURG customers from 1 January 2008, as ARBURG has taken on established IPLYH employees, including three service technicians and a salesperson. And the head of IPLYH, Juan Carlos Lachica, will also continue to work in Sales. The Manager of the new ARBURG subsidiary in Mexico is Guillermo Fasterling, who also has many years of experience and broad-ranging, special-



ist knowledge of the injection moulding industry.

As is the case with all ARBURG subsidiaries worldwide, the new subsidiary in Mexico also provides a comprehensive range of services. These include, for example, highly-qualified service technicians for on-site support, a well-stocked spare parts store for rapid availability of spare parts, and a training room. The range of services is completed by the demonstration room, where ARBURG products can be presented and tested and where customers receive comprehensive support and training.

For full information on the new subsidiary, visit the Mexican ARBURG website at [www.arburg.com.mx](http://www.arburg.com.mx).

Subsidiary Manager Guillermo Fasterling (right) receives sales support from former trading partner Juan Carlos Lachica (left).



# XRAY: Small-scale

**W**hen we talk about 1:8, 1:10, and 1:18 these are not sports results, but scale sizes which open up a fascinating automotive world on a small scale: radio-controlled model cars. A booming market has developed around high-quality RC (radio-controlled) cars worldwide.

The racers have long since left the playroom! Sophisticated racing paddocks with high-tech equipment can be seen at everything from hobby-level through to professionally-organized racing series throughout the world. Here, the highest demands are put on the materials, designs, and tuning of these model vehicles.

Slovakian engineer Juraj Hudy is regarded as a living legend of the RC scene and has already designed and produced model cars in small volumes since the 70's. With his XRAY company, founded in 2000, Hudy is one of the world's leading manufacturers of premium model cars, which have already won numerous national and international titles and awards during the company's relatively short history, including 16 times USA



National Champion Title, European Champion and dozens of national champion titles around the world.

Month after month, tens of thousands of models leave the new factory in Trenčín (Slovakia) which opened in 2007. Research and development, marketing, sales, administration, production, and two test circuits are strategically situated in an area of about 25,000 square metres. The surface of one of the test circuits can be changed from asphalt to carpet. An additional test track is located in the outdoor area. All XRAY models are tested here, from touring cars and buggies to "truggies" - with either electric drives or combustion engines.

By bundling the entire value-added chain at one location, the Slovaks succeeded time and time again in launching product innovations onto the market in a specifically targeted manner. Fast produc-

tion times and short delivery times are the basic requirements for a successful business, which includes a handful of international premium-segment manufacturers. In the worldwide race car scene, XRAY has for years enjoyed the reputation for consistently innovative and ultra-high-quality manufacturing. To constantly live up to this reputation is a challenge that also applies to materials and processing.

Depending upon scale size and model type, whether on or off road, high-end racing model or "hobby" version, the cars consist of 40–85% plastic composite parts. The total number of individual parts stretches into the hundreds. In addition to aluminium, steel and other metals as well as glass fibre, plastic is the prevalent material thanks to its weight and cost advantages and its specific characteristics.

With speeds of up to 100 kilometres per hour and extreme racing loads, de-







Photos: XRAY

# racers

demands on these high-tech model vehicles are very high. In order to meet its own high demands as market leader, XRAY relies on the European production location as well as on German and Swiss production machines. ARBURG injection moulding machines have been used for production since 1999. Then, the company was Ing. Juraj Hudy, which today still produces moulds and accessories for the models. All of the parts made from plastic such as the steering unit, gear unit, spur gears, levers, chassis and spoiler are decisive components for racing performance. The suspension, made entirely of plastic, is especially critical as it is responsible for the set-up of the running gear and thus for the handling characteristics. In addition to 100% production quality, the correct material mix is important in providing the right combination of stability and flexibility.

At XRAY, great importance is placed on quality assurance at all stages of production. In the well-connected RC community, quality defects can quickly have a negative effect on sales. Specific employees are involved with quality assurance in all departments. As development, testing, and production are performed

centrally, potential problems can be quickly evaluated and eliminated. Perfect quality and precision are the pillars of the worldwide success of the technical craftsmen, whereby they rely completely on ALLROUNDER technology. "The ARBURG machines that XRAY uses are high-quality and reliable machines and ARBURG provides a very good service," says engineer Juraj Hudy quite casually.

It is seldom that his high-tech model cars drive alongside or even behind the field. XRAY "Luxury Model Racing Cars" regularly win national and international titles in various classes and on a multitude of different terrains. In addition to driving skill, the materials and set-up are decisive – just like on the real thing.



Juraj Hudy (bottom left and top right): has been an expert in radio-controlled model cars for decades. The cars are produced at the modern factory in Trenčín, which offers ideal conditions with regard to both production of the individual parts and testing of the cars. (photos, left).

## XRAY®

### INFOBOX

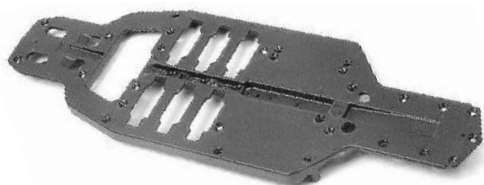
**Founded:** 2000

**Employees:** approx. 80

**Products:** Complete production of premium segment RC cars

**Machine fleet:** Four ALLROUNDERS

**Contact:** XRAY, Trenčín/Slovakia, [www.teamxray.com](http://www.teamxray.com)





# Invest



**T**here are causal reasons which ensure that quality is consistently produced within a company. And of course, this also applies to ARBURG. Here, several factors are responsible for the manufacture of reliable injection moulding technology. In addition to good products, these include a forward-looking corporate policy, the employees and their know-how. However, in order for this extensive knowledge to be utilised for the benefit of the company, it first has to be developed. At ARBURG, this is achieved by means of an in-house training system, which for years has obtained the best possible results for the company's trainees.

Training began at the company as far back as 1949, long before the first ARBURG injection moulding machine was delivered to a customer. Since this time, virtually from the very outset, ARBURG has invested in the know-how of its employees.

The training system, which has received several awards (ARBURG was even presented an award for outstanding train-

ing from the German Federal President in 1984), today employs eight full-time instructors for commercial and technical training. Since 2001, the department has been housed in a training centre with a floorspace of 1,600 square metres, featuring generous training classrooms and workshops with modern equipment to facilitate theoretical and practical learning in the best possible manner. In order to ensure the long-term relevance of the training programme, the mechanical and electrical workshops work with the very latest machines. The commercial and technical departments are fully computer integrated. Nevertheless, basic technical skills continue to play an important role during the training period in order to ensure balanced course content for the technical professions, enabling an optimum transition into the trainees' relevant future working environment at ARBURG.

The training programme currently includes courses for vocational qualifications as industrial clerk and IT specialist for the commercial sector, electronics technician for automation technology, industrial technician, engineering technician, mechatronics technician, process engineer-

ing technician for plastics and rubber technologies and technical draughtsperson, as well as courses in conjunction with vocational academies in the fields of mechanical engineering, information technology, industry, international business, commercial information technology and industrial engineering and management. Qualified students can consolidate the material learned during their studies

# ment in the future



The ARBURG trainees face the future full of motivation and self-confidence: modern training facilities and approaches prepare the young people for the difficult challenges ahead in the field of technology and commerce.

under practical conditions, complementing the theoretical basis of their work. Training schemes and internships, run in collaboration with local schools, lead to better mutual understanding and provide students with greater insight into the working environment. This is particularly important for ARBURG because it means potential trainees come into contact with the company and internal matters at an early stage.

A further important component of the training is co-operation in various project groups. Trainees from the various professions co-operate in an interdisciplinary manner in order to solve a wide variety of tasks. The philosophy behind this is for the trainees to see themselves as a group, regardless of the job they are learning. This brings the direct correlation between the working atmosphere and the quality of products into play. And a good working atmosphere is only possible if the employees know and value one another. The young people are thus fully prepared for group work in the "allround team", into which the trainees are integrated after being permanently employed at ARBURG. On the subject of jobs: At ARBURG, the

planning aims at the subsequent employment of all trainees within the company. Following an intensive phase of candidate selection, only those trainees and vocational academy students for whom there will be an actual need within the company following their training are accepted. This means that those who receive a training place at ARBURG today will also have a job at the company tomorrow.

The success of this training system, which is innovative and traditional in equal measure, is always in evidence during the interim and final examinations. Here, the trainees and students of the ARBURG vocational academy are invariably among the best in their year. The trainees have received numerous honours for their excellent performance from their colleges as well as at regional and state levels. Between 1999 and 2007, they won a total of 145 prizes, which constitutes 48 per cent. Regularly, over 50 per cent of them receive 'A' grades in their exams.

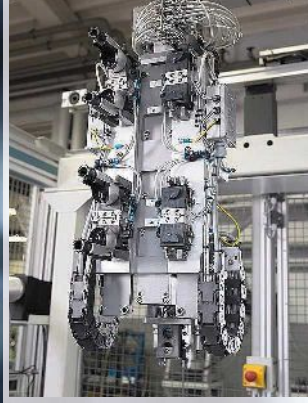
In almost 60 years of training, more than 1,300 trainees have learned their profession at ARBURG. This amounts to a trainee proportion of between eight and ten per cent and represents a significant



contribution to assuring and enhancing corporate and product quality, and ultimately customer satisfaction, which are so vital to the company.

Potential trainees can find out more about "training in the first division" on the ARBURG trainee homepage by visiting [www.arburg.com/ausbildung](http://www.arburg.com/ausbildung). By the way, this website is also produced and maintained by company trainees. More over, it was Germany's first website to be designed exclusively by trainees.

# Automated



**P**articularly for parts suppliers in the automotive sector, the achievement of time (and consequently cost) advantages has played a decisive role for many years. For European producers and suppliers, this has become even more relevant in view of the global, and in particular Asian, competition. Companies who aim to produce high volume parts in-house must comprehensively automate the production process.

An automated production concept of this kind has been comprehensively implemented by Kongsberg Automotive Germany in Dassel for the manufacture of gear lever knobs. ARBURG was the project partner who implemented the complete system on both the mechanical and technological side.

As a globally operating company, Kongsberg Automotive Holding ASA develops, designs, produces and sells innovative products and technical components for industrial applications in all areas of automotive engineering. Kongsberg components are employed throughout the automotive sector as practical, cost-effective and reliable solutions. The company is based in Kongsberg in Norway. Its current annual turnover amounts to around 1 billion euros. 50 Kongsberg factories in

# automotive



20 countries around the globe produce system solutions for vehicle manufacturers worldwide. More than 11,000 employees ensure that customer orders are carried out exactly as requested.

In co-operation with ARBURG, the subsidiary Kongsberg Automotive Germany, formerly Teleflex Automotive Germany GmbH in Dassel, has developed a production line for manufacturing gear lever knobs for the automotive sector. A pre-assembled, combined insert part consists of a die-cast insert in which a plastic insert is clipped. This insert part is pre-assembled on the production line and then encapsulated with thermoplastic polyurethane (TPU).

The production cell is highly autonomous. The insert parts are provided in bulk then separated, assembled, aligned, inserted and encapsulated. Following encapsulation, the finished parts are removed, cooled and conveyed away.

Integrated in the production cell is an ALLROUNDER 420 C 1300-800 machine featuring dual-pump technology that enables simultaneous movements. The mould has four cavities.

Of particular interest is the complex handling of the parts, which is performed by a MULTILIFT V in an overhead design. The robotic system is arranged transversely to the machine axis; the load bearing ca-

capacity is 15 kilograms. The complexity of automating the production process places particular demands both on the MULTILIFT V and the peripherals, especially with regard to precise provision and handling of the parts. During parts handling, it must above all be ensured that the visible surface of the finished parts is not touched.

The process sequence is as follows: The insert parts are initially provided by means of two steep belt conveyors. In the bowl feeders, the insert parts are aligned, separated and fed in the correct position to the subsequent linear conveyors. The linear conveyors transport the insert parts to the transfer position. The gripper's transfer module picks up the die-cast inserts from the linear conveyor and moves above the assembly device. The gripper is secured precisely above the plastic inserts located in the assembly device with the aid of a docking plate. A pneumatic cylinder pushes the plastic insert into the die-cast insert from below and clips the two parts together. The pre-assembled insert part is then set down on the transfer station. Four assembly processes are performed in each machine cycle. In order to achieve a paired alignment in relation to the mould cavity, two insert parts are rotated by 180 degrees on the transfer station using a swivel device.

The gripper of the MULTILIFT V takes the insert parts from the transfer station with the insert module. The parts, which are now positioned horizontally, are moved to the open mould via the gripper. The removal module picks up the four finished parts and transfers them to the parallel grippers. The gripper then moves to the insertion position, aligning itself by means of centring pins on the mould. The pneumatic lift plate pushes the insert parts horizontally into the mould from the ejector side. The gripper then retracts.

The finished parts are set down on a spiked conveyor belt and cool down there

The encapsulated gear lever knobs file out of the production cell (photos, left). The foaming process was replaced with injection moulding thanks to the project system.

for at least 30 minutes in order to prevent surface damage. The finished parts are collected in a crate, counted and then transferred to a heavy-load roller conveyor.

Thanks to the customer-oriented development, process engineering consulting and implementation of the project system, Kongsberg Automotive Germany was able to replace the foamed gear lever knobs with injection moulded ones. The objective of automating the manual working steps was fully achieved. This prevented production of this component being moved abroad.

## INFOBOX

**Location:** Dassel, Germany

**Employees:** approximately 300

**Products:** Gearshift systems, gear lever knobs with inserts using foaming and injection moulding processes

**Contact:** Kongsberg Automotive Germany, Am Burgberg 7, 37586 Dassel, Germany, [www.kongsbergautomotive.com](http://www.kongsbergautomotive.com)



# TECH TALK

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

# Energy-efficient

**T**he injection unit is at the heart of an injection moulding machine. The main task of this unit is optimum melt preparation under a wide variety of process settings. The size of the injection unit frequently determines the installed power of an injection moulding machine and therefore also the extent of the drive's no-load losses. This is because the highest energy consumption usually occurs at the injection unit.

The choice of injection unit size therefore has a considerable influence not only on moulded part quality, but also on energy consumption. The highest possible utilisation of the injection unit in relation to its maximum material throughput is decisive for a high degree of efficiency and energy conservation.

The maximum material throughput provides information on the melting capability of an injection unit up to which optimum melt preparation is ensured. The screw pitch volume and the material-specific dwell time in turn are determining factors for the melting capability. Dwell time can be understood as the time that passes

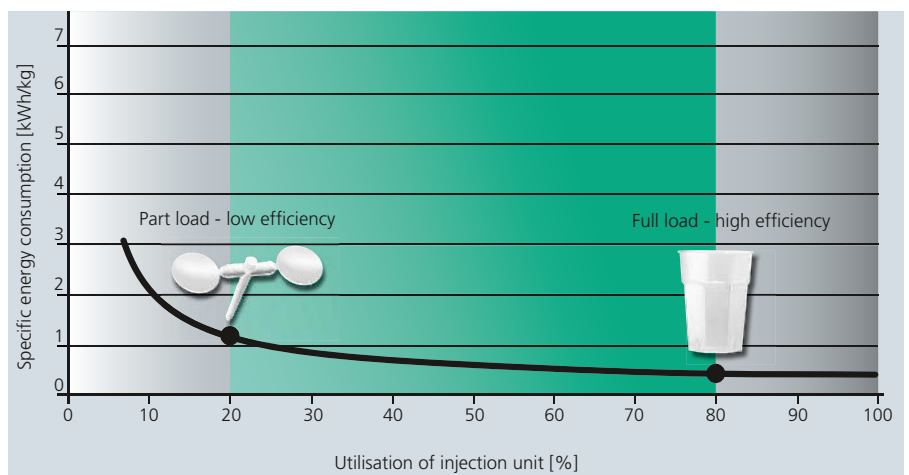
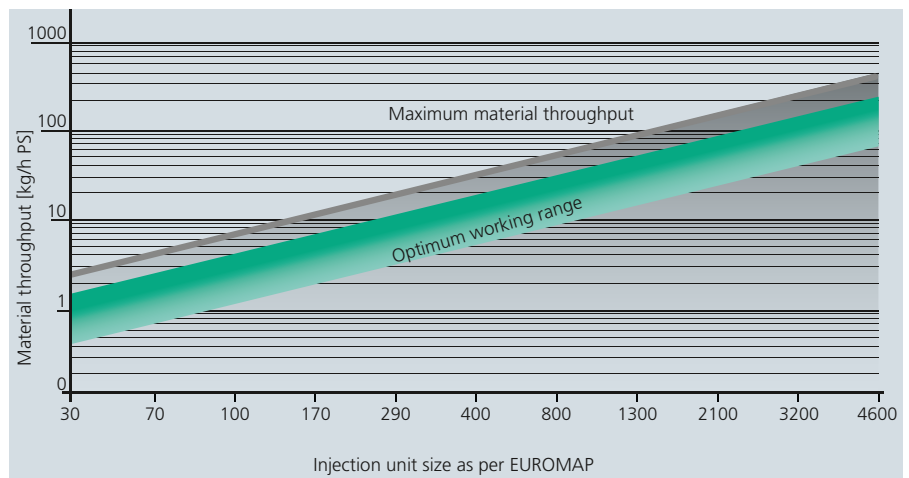




Photo: FLIR Systems

# design

from when a grain of granulate enters the plasticising cylinder to when it exits through the nozzle. The dwell time specific to plastic ranges from approx. 30 to 600 seconds for standard plastics and 60 to 600 seconds for technical plastics. This defines the limit values for maximum possible and minimum necessary melting capability of an injection unit. However, it is recommended not to use the full melting capability of an injection unit, but rather to utilise the optimum working range between 20 and 80 per cent of the total capacity.

Based on material throughput, it is also very easy to determine which injection unit sizes come into question (graph, top). The material throughput of a specific application is dependent on the shot weight and cycle time of the injection process. As illustrated by the lower graph indicating specific energy consumption, efficiency can be improved by a factor of four or more by observing these recommendations. The higher the utilisation of an injection unit, the greater its efficiency and the lower the specific energy consumption. High utilisation of the injection unit is helped by short cycle times (example:

packaging item). Applications with long cycle times, for example, necessarily result in a higher specific energy consumption (example: thick-walled optical parts).

In order to ensure the greatest possible flexibility when adapting the machine size to the injection process, ARBURG offers a comprehensive catalogue of modular machine elements and technologies. Of particular interest here are the varied combination options with regard to clamping units (clamping forces and distances between tie bars) together with injection units and drive technologies. In this way, an ideal combination in terms of energy can be put together, even under unfavourable conditions. This flexibility is particularly useful where the required machine size does not allow for a fully-electric and consequently energy-optimised drive.

However, besides the injection moulding machine, moulds and temperature control devices also exert considerable influence on the energy consumption of an injection moulding process. For example, when moulds have temperature control, it is extremely important to provide appropriate insulation for the mould. Otherwise, as with a poorly insulated house, large

Optimum working range of injection units in relation to material throughput (graph, top). Specific energy consumption as a function of material throughput (graph, bottom).

quantities of heat will simply be discarded, unutilised, around the injection moulding machine or into the environment. Insulation measures on hot runners also help to save energy. Another important point is that temperature control devices must be designed for the moulds' specific temperature requirements.

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**Internationally original.** Those looking for flexibility, quality, performance and durability, are in the right place with ARBURG. In addition to our high standards in production and vertical integration, there is another powerful argument: our entire product range is characterized by the attribute "Made in Germany". Because all of our machines and components are produced exclusively at the parent factory in Lossburg, Germany. And this will not change.

You can rely on that!



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