

# today

The ARBURG magazine

Issue 39

2008



2008

**ARBURG**

Energy Efficiency Award

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## MASTHEAD

### today, the ARBURG magazine, issue 39/2008

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The ARBURG energy-efficiency award is part of the "Energy Efficiency Allround" initiative and is being presented for the first time within the framework of the Fakuma 2008.



## Dear Readers,

2008 truly reflected the spirit of our corporate objective "Energy Efficiency Allround". In order to communicate the complex topic of energy-efficient injection moulding with all the various influencing factors to our customers worldwide, we have, for example, been on a world tour since April with "Technology on Tour 2008". However, although they sensitise the participants to the topic of energy efficiency and highlight certain approaches to energy saving, these events are only the first step. The second step must be implemented by the company itself, in that it critically examines its production from an energy viewpoint, discovers energy-saving potential and also takes account of the energy aspect when considering new investments. ARBURG provides its customers with proven support and advice in all areas. From the selection of suitable machines, mould and process technology, material and product designs through process optimisation to the achievement of energy-efficient production.

Because our aim is not only to work as energy-efficiently as possible in our own company, but rather to reduce energy consumption among our customers with our products and services. In this regard, awards will be presented to customers who, on account of their activities, excel in energy efficiency. For this purpose, we have launched the ARBURG energy-efficiency award. The first prize-winner is Wago Kontakttechnik, who will be ceremonially presented with the award at Fakuma 2008. You can read more about this and our presence at the Fakuma trade fair on the following pages.

We hope you enjoy reading this new issue.

A handwritten signature in blue ink, appearing to read "M. Grandt", written over a vertical blue line.

Michael Grandt  
Managing Director Finance and Controlling

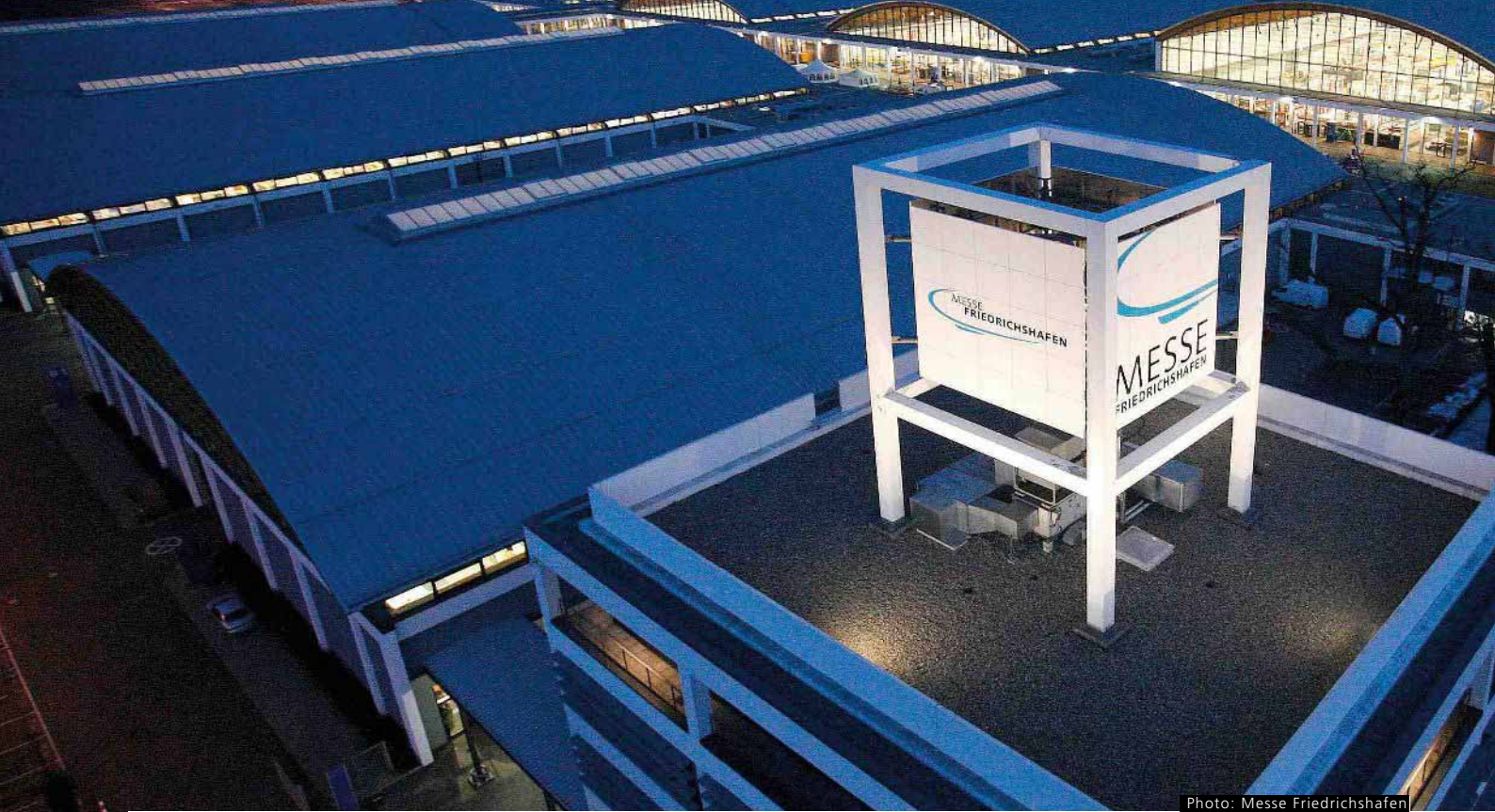


Photo: Messe Friedrichshafen

# Fakuma highlights



**A**t Fakuma 2008, which takes place from 14 to 18 October in Friedrichshafen, ARBURG will present all facets of innovative injection moulding technology. For all those who wish to inform themselves in advance, look back on their visit to the exhibition or get up to date independently of Fakuma, Herbert Kraibühler, Managing Director Technology & Engineering at ARBURG, discusses the highlights and future trends in an interview.

**today:** What are the main focuses of this year's trade fair presence?

**Kraibühler:** The focus is on energy-efficient injection moulding production together with the various influencing factors and on robotic and control systems featuring groundbreaking innovations.

**today:** What will visitors actually see at Fakuma regarding the topic of energy efficiency?

**Kraibühler:** We will be presenting a total of four machines with the ARBURG "e<sup>2</sup>" energy efficiency label: two

electric ALLROUNDER A and two hydraulic ALLROUNDER S machines with electro-mechanical dosage drive. High-speed thin-wall and packaging applications, the processing of thermoplastics and liquid silicone using the two-component process and a complex production cell with integrated downstream assembly will be demonstrated on these energy-efficient machines.

**today:** Which ALLROUNDERS are you presenting as high-speed machines?

**Kraibühler:** We will present an electric as well as a hydraulic ALLROUNDER as high-speed machines and thus demonstrate that both machine types, with the appropriate features, are capable of fulfilling the high demands of this sector.

On the electric ALLROUNDER 570A, six high-quality, labelled yoghurt tubs will be produced in a overall cycle time of 3.6 seconds, using the IML process. With integrated, adaptive hot runner control, a high-performance plasticising unit and a mould featuring a pneumatic needle shut-off system, the exhibit comprehensively fulfils the demands





On the subject of energy-efficient injection moulding, ARBURG is also presenting the SELOGICA feature "energy consumption measurement" at Fakuma 2008 in Friedrichshafen (below right).

with regard to material preparation and speed. As a further high-speed, high-performance machine, the ALLROUNDER 630 S will be presented, producing 48 bottle caps in 4.8 seconds. In order to achieve a high material throughput in a very short cycle time, this exhibit is also equipped with a high-performance plasticising unit, fully accumulator-driven technology and an energy-saving electro-mechanical dosage drive.

**today:** The "e<sup>2</sup>" energy efficiency label in itself gives no indication of the level of energy consumption. How can your customers know how much energy the machines actually consume?

**Kraibühler:** To meet this requirement, we offer the SELOGICA feature "energy consumption measurement" with which the average as well as the periodical energy consumption of the ongoing injection moulding process can be registered, clearly displayed and analysed.

For example, the energy consumption for each moulded part, cycle and task can be determined as well as the specific overall energy consumption and also the

## Energy-efficient injection moulding

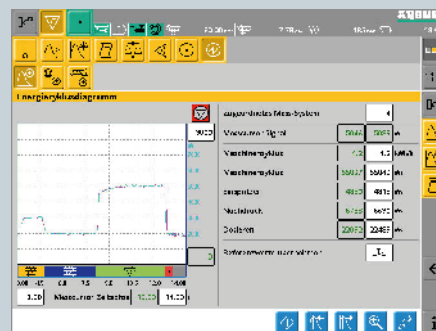
**ARBURG distinguishes its energy-efficient machines with the "e<sup>2</sup>" energy efficiency label. These include the electric ALLROUNDER A and the hydraulic ALLROUNDER S with electro-mechanical dosage drive or the 'advance' equipment package.**

But energy efficiency in the injection moulding process depends not only on the machine and its drive technology, but on the process as a whole, including mould technology, material and product design. Therefore, for the purpose of comparison, it makes sense to analyse not absolute, but specific energy consumption, which takes account of the different process settings and sequences. It is essential that the production system be considered in its entirety, selecting the injection moulding machine, mould and peripherals to suit the spe-

cific requirements and installing them in a manner suitable for the process.

With regard to the injection moulding machine, the modularity of the ALLROUNDERS offers varied options for combining clamping units (clamping force and distance between tie bars) with injection units (shot weight and material throughput) and drive technologies.

In order to provide detailed explanations of the complex relationships in energy-efficient moulded part production and to highlight energy-saving potentials, ARBURG has this year launched the worldwide series of events "Technology on Tour 2008". Moreover, ARBURG offers its customers comprehensive consulting expertise regarding the subject of energy-efficient injection moulding.



effects of changing the process parameters. The energy consumption thus becomes more transparent and can also be influenced. In order to visually demonstrate energy consumption measurement at Fakuma, we will additionally show the relevant SELOGICA pages on large screens for two of the exhibits. Furthermore, the energy consumption data can be called up at the central production control station.

**today:** What function does the control station fulfil at Fakuma?

**Kraibühler:** With the central production control station, we are presenting

our products for quality assurance and production optimisation: The ARBURG quality assurance system (AQS) and the ARBURG host computer system (ALS), to which all ten exhibition machines are connected. At Fakuma, it is important to us to be able to clearly demonstrate how the energy efficiency in production can be increased through centralised production planning and control. The ALS, for example, provides a comprehensive production overview as well as fast and reliable access to current data for the ongoing injection moulding production, which can thus be

## Controlled production

**Production optimisation and quality assurance are two important aspects with regard to energy-efficient production. Thus, beyond the injection moulding process itself, measures such as optimising the work processes in production as well as proactive production planning can contribute to increasing energy efficiency.**

The aim is to sustainably reduce downtimes and set-up times as well as the number of heating and start-up phases (i.e. "non-productive" but nevertheless high-energy phases) by means of appropriate planning and optimisation of batch sizes. Especially during start-up, unnecessary material costs as well as energy costs are generated through the production of reject parts. Targeted machine and mould maintenance plays a considerable role in reducing faults in production and thus unplanned machine downtimes. Furthermore, it provides for greater planning reliability for the entire production process.

Quality assurance measures ultimately reduce the reject rate and therefore also



provide for energy and material savings. For this purpose, it is initially necessary to create a qualified process evaluation in order to obtain information regarding process stability. Monitoring and documentation of the production process are then addressed in a further step. These requirements can be comprehensively fulfilled using the ARBURG quality assurance system (AQS) and the ARBURG host computer system (ALS).





Machine and mould maintenance can be optimally planned using the ALS (left). Thanks to the implemented SELOGICA user interface, the six-axis robot can also be conveniently programmed (right).

effectively planned and implemented. Thanks to its modular design using independent modules, the system can be flexibly adapted to customer requirements and is consequently also of interest to small injection moulding companies. Moreover, ALS makes it possible to plan preventive mould and machine maintenance in a targeted manner. This includes oil analysis and machine calibration, which will both also be presented live and explained by our service team at the trade fair.

**today:** Which innovations in the field of robotic systems will be presented?

**Kraibühler:** The highlight here is the production cell built around an ALLROUNDER 570 S, in which the finished moulded parts are removed and subsequently processed fully automatically by a six-axis robot from KUKA. The special feature here is the implementation of a SELOGICA user interface featuring the robot control system, which was designed in close cooperation with FPT, KUKA's OEM partner. This allows machine installation technicians to perform sequence programming of the complex six-axis movements of the robotic system in their familiar injection moulding environment without outside assistance. The integrated production cell automation communicates with the SELOGICA machine control system via the robot interface and an ad-



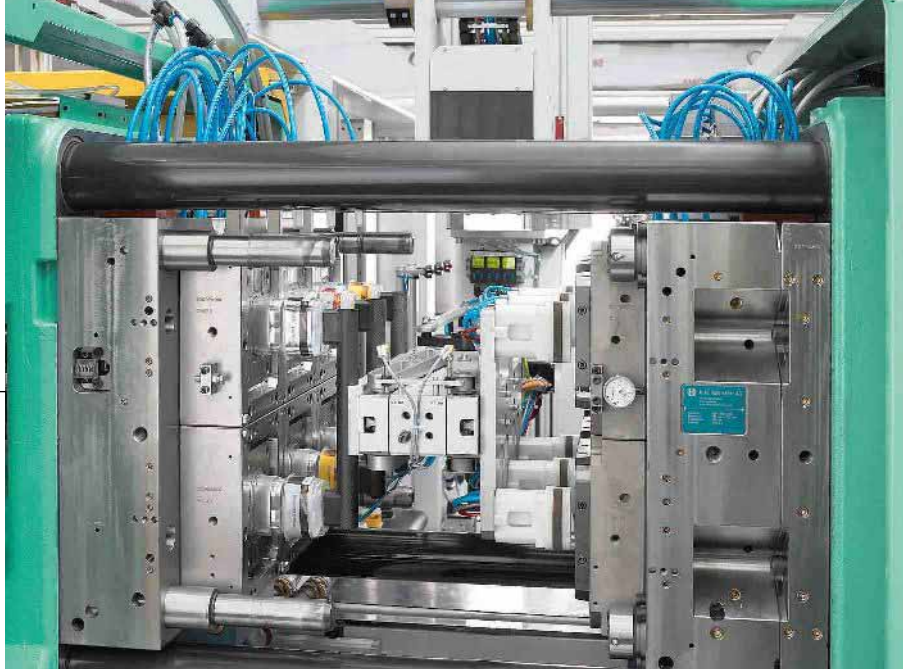
## Easy control

**The more complex the moulded part production and therefore the production processes become, the higher are the demands on machines, robotic systems and, ultimately, on the control system.**

Despite, or rather because of the increasing complexity, programming and control even of complete production cells should become increasingly simple and more convenient. In this connection, the advantages of the centralised SELOGICA control system, with which all the ALLROUNDERS operate, become

fully apparent. It integrates robotic systems and additional peripherals and, with the graphics sequence editor, offers a simple and intuitive operating philosophy. Examples of the continuous further development with regard to greater operating convenience are the SELOGICA 'direct' with touchscreen, teach-in programming for robotic systems and the implementation of the user interface for the control of a six-axis robot.

An example of a complete production cell, in which all components and processes are perfectly harmonised, is the IML application for the production of yoghurt tubs at Fakuma.



ditional fieldbus expansion. Through the expanded real-time fieldbus connection, even complex mould entry operations are very easy to implement.

**today:** Which product is manufactured on this system?

**Kraibühler:** An insulating rail for a domestic iron made from thermoset is produced. In order to optimally process the BMC moist polyester, the ALLROUNDER is equipped with a position-regulated screw, a newly developed INJESTER screw compression device for optimal material feed and an integrated mould heating system. Thanks to feed pressure control specially developed for this application, the servo-motor driven feed screw of the injester compression device enables gentle and very consistent material preparation, even in the case of large shot weights.



**today:** Are there also innovations with the ARBURG robotic systems?

**Kraibühler:** Of course, we have also further developed our own robotic systems. For example, a MULTILIFT V SELECT will be presented for the first time at Fakuma on an ALLROUNDER GOLDEN EDITION machine. From autumn 2008, it will also be possible to equip these machines with an ARBURG robotic system, significantly extending the range of applications for the MULTILIFT V SELECT. Furthermore, on this exhibit we will also dem-

## Complete automation

**The trend with regard to moulded parts is towards higher complexity and integrated functionality. In order to be able to produce these parts economically and thus in an energy-efficient manner, the field of automation is gaining in importance.**

The demand is for individual production cells with a convenient control system, in which the injection moulding machine and robotic system are optimally

harmonised and upstream and downstream production steps are fully integrated. ARBURG has a project department especially for this purpose, which designs and implements customer-specific, tailor-made complete solutions. The customer can therefore be sure that the components are fully compatible with one another and that he has a central point of contact for design, processing, commissioning, CE certification and after-sales service.

onstrate the simple and convenient programming of the robotic system with the new teach-in function. Here, by means of manually performed steps, the robotic system can learn the positions it has to move to in order to pick up and set down parts with the utmost precision. These steps are then adopted as cycle symbols in the clearly-structured programme sequence.

The innovations in the robotic system area also clearly illustrate the trend in the field of control systems. In the future, these will become increasingly "intelligent" in order to be able to easily and conveniently program and control complex production processes.

**today:** Such "intelligent" control systems play a decisive role in the automation sector. Are there any other projects, apart

from the IML application and the six-axis robot system?

**Kraibühler:** Yes, our largest machine, the ALLROUNDER 920 S with a clamping force of 5,000 kN and the large 4600 injection unit is also integrated in a complex production cell. A patented folding crate from IFCO Systems will be produced, the five individual parts of which are produced in a single cycle, removed by the vertically-operating MULTILIFT V robotic system and subsequently assembled fully automatically. A total of six ALLROUNDERS with a wide variety of robotic systems will be operating at Fakuma.





**today:** What range of machine sizes will be presented at Fakuma?

**Kraibühler:** We will present our entire spectrum. So in addition to the largest ALLROUNDER 920 S with a clamping force of 5,000 kN, the smallest machine in the series is also represented. The ALLROUNDER 170 S is equipped with a 12 mm screw and processes POM micro-granulate. Micro gear wheels with a weight of 0.001 gram will be produced, which are removed by a horizontally-operating MULTILIFT H robotic system and set down in trays.

With the ALLROUNDER 175 V, featuring a clamping force of 125 kN, we present the smallest vertical machine. This is equipped with a highly dynamic servo-electric rotary table, the two mould halves of which allow the insertion and removal of parts during the injection moulding process. This machine can consequently be easily integrated into automated production lines.

**today:** Is the new machine size of the V series also represented at Fakuma?

**Kraibühler:** Of course, the new ALLROUNDER 375 V with a clamping force of 500 kN is presented in the same way as during its premiere at this year's Technology Days with the Exjection® process from IB Steiner and Hybrid Composite Products GmbH. This enables the production of long, thin-walled and structured components with integrated end caps and functional geometries, also made from viscous thermoplastics. With this application, featuring a horizontally installed mould, the free space system can

be fully utilised. There are no limitations with regard to mould length, stroke and, consequently, component length. The servo-controlled transfer movement during the injection process is integrated in the SELOGICA control system.

**today:** At the Technology Days, you also announced that ARBURG would present an energy-efficiency award. Who will receive this?

**Kraibühler:** Within the framework of Fakuma, we will present WAGO Kontakttechnik from Minden with the first ever ARBURG energy-efficiency award for the measures they have taken with regard to energy efficiency.

The ALLROUNDER 420 C GOLDEN EDITION proves its potential with the production of a sophisticated technical part with a film hinge (above). The new ALLROUNDER 375 V is presented with the Exjection® process (below).



# WAGO recei

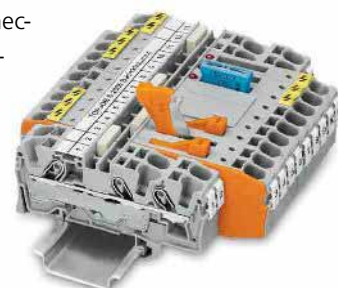


IRIS certification (International Railway Industry Standard) - in record time.

At WAGO, being a pioneer is something of a tradition. Consequently, the company has long been interested in the efficient use of energy. Through improvements in buildings, processes and applications, potentials have been tapped in order to achieve a reduction in energy requirements. For example, the waste heat from machines has been used for heating purposes for some 30 years, all new buildings have been equipped for solar energy for about twelve years and at the development centre that was completed in 2001, energy consumption has been cut by a third through the use of a geothermal heating system. In 2008, a new power plant began operation at the extremely extensive factory site in Minden, which provides heating to all the buildings as well as compressed air to the nearby ones. In addition to centralisation, the existing compressed air generation systems have also been replaced in recent years by more high-performance and energy-saving ones, which have been specially designed and optimised for WAGO. The resulting reduction in power consumption was immediately noticeable. In terms of air conditioning, the following rule applies throughout the company: Air conditioning is only used where it is technically necessary, for instance in the mould construction

**W**ithin the framework of Fakuma 2008, the first ARBURG energy-efficiency award will be presented to WAGO Kontakttechnik GmbH & Co. KG, an internationally operating company which, thanks to its corporate philosophy, has excelled with regard to its activities in the field of energy efficiency for many years.

The company's portfolio is divided into the two divisions of "Electrical Interconnections" and "Automation". WAGO products can be found wherever electricity flows and reliable connections that are resistant to vibrations, gas and corrosive atmospheres are required. The application range extends from insulation technology for the home through to single-purpose buildings and from industrial, applications and process engineering through to railway transportation. Accordingly, WAGO is not only certified to DIN ISO 9001:2000 and ISO 14001, but is also among the first companies in the field of electrical connection technology/automation to be awarded the new international railway standard,



WAGO  
Kontakttechnik  
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Energy Efficiency

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or "automation" areas. Elsewhere, insulation, green roofs on large buildings and saw-tooth roofs with north-facing skylights are employed, as well as, in keeping with the company's products, building automation for natural ventilation and custom-designed lighting.

In the field of injection moulding, WAGO also pursues a clear strategy, which managing director Ulrich Bohling



Photos: WAGO

explains as follows: "Since 2004 we have only invested in energy-efficient electric injection moulding machines, world-wide." Today, the company operates a large number of electric machines, including 33 ALLROUNDER As, achieving energy savings of more than 30 per cent. An important parameter in this context is energy consumption in relation to the volume of plastics processed. "In recent years, this value has fallen steadily and will continue to do so," says Bohling.

He adds that while the low energy consumption of the electric machines is very important, the higher precision, repeat accuracy and speed of the ALLROUNDER A machines plays an even more important role. "Because we must achieve ever more

innovations within increasingly small installation spaces with regard to our products, the implementation of reliable and reproducible processes is gaining more and more importance," explains the Managing Director. The lower noise and heat emissions are further important arguments.

World-wide, the company operates over 100 injection moulding machines; about a third of these are ALLROUNDERS. Ulrich Bohling summarises the reasons for this, "For 44 years now, ARBURG has been a machine supplier for WAGO. They have always provided innovative and sophisticated machine technology which works from the start and has always fully met our demands."

WAGO was both delighted and surprised at receiving the ARBURG energy efficiency award: "Energy efficiency is a milestone in order to survive in the face of international competition. To date, we had not realised that the measures introduced by us had left an unusually positive impression, because we regard our approach to be self-evident. This makes us all the more proud that our energy-efficiency measures have received recognition from ARBURG and it is with great pleasure that we accept this award."



WAGO executive management (from left to right): Axel Börner (Administration and Human Resources), Sven Hohorst (Sales and Development) and Ulrich Bohling (Production, Labour Planning and Quality Assurance)

## INFOBOX

**Founded:** 1951 in Minden

**Locations:** Injection moulding production at several locations in Germany, Switzerland, India and China

**Turnover:** 431 million euros in 2007

**Employees:** 4,786 employees world-wide (as at year's end 2007)

**Products:** Electrical connection technology using the spring clamp method, automation products based on field-bus technology and the spring force principle, interface components for the industrial, process technology and building technology sectors.

**Machine fleet:** More than 100 injection moulding machines with clamping forces from 300 to 2,000 kN

**Contact:** WAGO Kontakttechnik GmbH & Co. KG, Hansastr. 27, 32423 Minden, Germany  
www.wago.com

# A perfect

**T**he cooperation between Delphi Connection Systems in Shanghai and ARBURG may have begun just over four years ago, but several successful large-scale projects have already been jointly completed. Thanks to their modular design, the 71 ALLROUNDERS and the ARBURG host computer system (ALS) supplied to date were configured and equipped to meet the detailed Delphi specifications. The requirements with regard to the complete integration of peripherals were also comprehensively met through the central SELOGICA machine control system.

Delphi Corporation is a leading global supplier of mobile electronics and transportation systems. It is headquartered in Troy, Michigan, USA. Delphi has some 159,000 employees worldwide and operates 153 wholly-owned manufacturing sites in 34 countries, with sales of 22.3 billion US dollars in 2007.

One of its operations is a Delphi Connection Systems plant in Shanghai, which was founded in 2002 and has enjoyed prosperous growth since it opened. Site employment has increased dramatically from 25 at the outset to 834 today. The plant manufactures electrical and electronic components for the automotive industry in Shanghai. The business is divided into three main product business units: electrical/electronic distribution systems, connection systems and electrical centres

The injection moulding production is part of the Connection Systems unit, where some 550 different products are manufactured on a total of 113 injection moulding machines. There are 71 electric and hydraulic ALLROUNDERS with a clamping force range from 500 to 5,000 kN, Delphi's relationship with ARBURG began in 2004 with the order of the first

ten machines, with an additional 61 being delivered in 2007. The two company's collaborative working relationship was demonstrated at the Chinaplas 2008 in Shanghai, where an ALLROUNDER was exhibited with a Delphi mould.

During his visit to the ARBURG stand, Simon Yang, Asia Pacific managing director for Delphi Connection Systems, outlined the strategy of the young and successful business, "Because synchronisation is very important for us, we work with one central supplier in each area." Asked why he has invested exclusively in



ALLROUNDERS since 2005 and why he works with ARBURG as a main contractor, he answers concisely with the words, "Reliability and costs." According to Yang, the first aspect applies both to the company itself and its ALLROUNDERS. This already became evident when the first ten machines were delivered. They were configured to the Delphi requirements within the shortest of delays and were delivered quickly and on time.

With regard to costs, Simon Yang takes a long-term view. For him, it is not only the purchase price, but much rather the overall economy of the machines that is decisive. For this reason, the company aims to invest more intensively in electric ALLROUNDER A machines, of which nine are already in operation. He succinctly explains the reasons for this view, "Because

# match



we are an independent company, we can only invest the money we have earned ourselves." Consequently, in addition to high product quality, the company's major focus is on cost control and reduction in order to maintain their current strong position in China.

Other important aspects of economical production are integration and optimisation. As a result, Delphi relies not only on central suppliers, but also on system suppliers like ARBURG, who provides concepts for complete production systems and also implements them. In this case all peripherals – including robotic systems, temperature control units, material dryers, mixers, conveyors and in some cases container changers for the finished parts – are integrated in the central SELOGICA

control system. For the managing director, this requirement further speaks in favour of ARBURG as well as their comprehensive engineering service.

In order to monitor and control the production processes and therefore product quality at all times, use of the ARBURG host computer system (ALS) completes the consistent strategy pursued by Delphi. Like the 71 ALLROUNDERS connected to it, the ALS was tailored to Delphi specifications and connected to the company's existing SAP network. An important ALS feature in terms of production monitoring is production release for each product version. This takes place according to the following procedure: When a new job order is received, the corresponding data record is loaded on the machine by the ALS. However, before production can begin, the machine operator has to scan in the barcodes for the machine, mould and material (original stock, regranalte, colour). If the combination matches that in the pending order, production is released. This scanning procedure must also be repeated following any interruptions in production.

In this area, Delphi receives support from the Control Technology Department, in the case of production cells, this

Seamless production at Delphi in Shanghai. One argument for the ALLROUNDERS and for ARBURG as a main contractor with regard to injection moulding equipment was the central SELOGICA control system.

is provided by the Project Department at the ARBURG headquarters in Lossburg. The local contact responsible for ensuring a prompt service in Shanghai is the city's ARBURG subsidiary. "All the ARBURG departments work hand-in-hand to provide us with first-class allround support," says Simon Yang. As a result, a new project is already under way, further extending the successful co-operation between Delphi and ARBURG.

## INFOBOX

**Locations:** Shanghai  
**Employees:** 834 (as at April 2008)  
**Products:** electrical/electronic components for the automotive industry  
**Machine fleet:** 113 injection moulding machines, of which 71 are ALLROUNDERS (as at April 2008)  
**Contact:** Delphi Connection Systems, 200 Yuanguo Road, Anting, Jiading Shanghai 201814, P.R. China [simon.yang@delphi.com](mailto:simon.yang@delphi.com), [www.delphi.com](http://www.delphi.com)





# Autom



**A**nyone who has consciously given attention to the subject, will have been amazed to discover the variety and the multitude of applications for lids and covers. Many of these often unremarkable moulded parts are equipped with seals for protection against dirt and moisture. These are normally rubber seals. However, seals made from liquid silicone rubber (LSR) are being increasingly used. Sinsheimer Kunststofftechnik GmbH (SKT) commissioned ARBURG with the development and construction of a fully-automated production cell for the injection of liquid silicone seals onto metal covers. The system operates fully autonomously, beginning with preheating of the components through to the leak test at the end of the production process.

"It was important for us to obtain a complete solution from a single source," explains SKT Managing Director Uwe Heiss. In addition to the machine itself, ARBURG was responsible for mould-related consulting and the entire automation.

The task: to inject an LSR seal directly onto the metal base material. The production process must be fully automated and the sealing of all produced parts tested. As Uwe Heiss goes on to explain, the specification was formulated in the shortest possible time with the support of the ARBURG



experts. "The fact that the ALLROUNDER machines are relatively easy to configure, proved to be an advantage at the planning stage."

The background for the demanding requirement profile is that SKT produces parts for numerous automotive suppliers and must meet their high quality requirements. "In comparison with the previously practised semi-automated production, we will have a continuous and reproducible production process in the future," says Uwe Heiss. As a further advantage, he mentions the short cycle time and the consequently significantly improved productivity. 35 injection moulding machines with clamping forces from 250 to 3,000 kN are in operation at the SKT parent factory in Sinsheim and in the production facility in Mosbach.

For this project, ARBURG designed a complex autonomous production cell. It is based upon a fully-hydraulic ALLROUNDER 520 C with a clamping force of 2,000 kN. The machine has been equipped with a size 350 liquid silicone cylinder module, an air blast device as well as a vacuum device and a hydraulic needle-type shut-off nozzle.

A robotic system suitable for the task at hand was selected:

a MULTILIFT V in cantilever design with a maximum load weight of 25 kg.

The metal covers with edge lengths of 180 x 330 x 14 mm (W x L x H) weigh about 400 grams.

The gripper mounted on the robotic system must also be appropriately robust and must perform a variety of tasks. It must insert parts on the nozzle side of the mould and must remove finished parts from the ejector side. For handling the parts, the gripper is equipped with insertion and removal modules that can swivel downwards through 90 degrees independently of one another.

Due to the required unit volumes, a two-cavity mould was installed. The seals must not contain any air enclosures. A pre-heating station for temperature conditioning the inserts, a cooling station and an inspection station for finished parts were integrated into the system. The parts are provided via an externally-loaded pater-noster system, without interrupting ongoing production. A special challenge posed by this project was the programming for

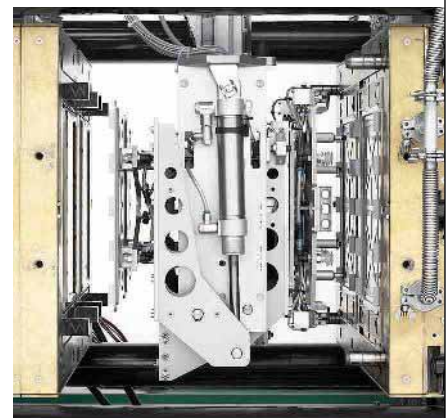
# ated sealing

the complex movement sequences of the robotic system. This becomes clear when considering a complete cycle: The system works on the "first in, first out" principle. A linear unit lifts two inserts at a time out of the paternoster system and transports them to the preheating station. The metal covers are preheated by a hot air blower to a maximum of 90 °C. The linear unit then transports the preheated covers to a transfer station.

If, due to an interruption, the specified heating time is exceeded, the system automatically sorts out the overheated covers and excludes them from further processing. The robotic system takes over the unprocessed parts and sets them down on a conveyor belt at the production cell outlet. From there, the operator can return the parts to the paternoster storage. The same procedure is applied to parts which have to wait too long in the transfer station.

In the next step, the gripper moves to receive the parts, swivels the insertion module through 90 degrees to the horizontal position and picks up the covers using vacuum suction units. Subsequently, the module again swivels through 90 degrees and moves into the open mould with the parts now held vertically. The gripper is aligned via centring pins which enter bushes on the nozzle side of the mould. A lift plate on the insertion module then moves forward in order to transfer the metal covers to the mould. They are held there by means of vacuum.

Insertion and removal are performed simultaneously, whereby the insertion module also plays a small role in the removal process. This is because as soon as the lift plate is in the forward position, four parallel grippers grasp the overflows protruding



In a highly-complex production cell (top), seals made from silicone are injection moulded onto metal covers. The MULTILIFT V in cantilever design (left and above) removes and transports the parts via a gripper that hinges through 90°.



The parts are set down on eight cooling places (top and left). From there, they are transported to an inspection station by the MULTILIFT V, are leak tested and are set down on a conveyor belt as good parts (below).



from the nozzle side of the mould. When the lift plate moves back, the grippers simultaneously remove the overflows.

Meanwhile, on the ejector side, the lift plate of the removal module has moved forward in order to remove the finished parts using vacuum suction units. The MULTILIFT V then moves out of the mould and the insertion module again swivels downwards through 90 degrees, so that the parallel grippers can drop the overflows. The MULTILIFT, with the empty insertion module swivelled downwards, then moves over the cooling table.

The exact target position depends upon the relevant dwell time of the finished parts on the cooling table. This is because the finished parts are taken in and out of storage according to the "first in, first out" principle. On the cooling table, a total of eight cooling places for four injection cycles are available. Cooling of the finished parts is supported by one fan per cooling place. Consequently, the insertion module is first lowered over those finished parts that have been subjected to the longest cooling period at this point in time, in order to collect them. The system then repositions itself, the removal module swivels downwards through 90

degrees and the two hot covers that have just been demoulded are set down onto the currently free places.

The robotic system then moves to the inspection station with the insertion and removal modules still swivelled downwards. Here, the removal module picks up the already inspected finished parts. Subsequently, the insertion module transfers the finished parts that were just collected from the cooling station to a pickup plate for the leak test. The MULTILIFT can now return to its starting position at the transfer station for the preheated inserts.

For the leak test, a hold-down device presses the covers against the pick-up plate before the hollow spaces under the covers are evacuated. Further handling of the finished parts depends upon the test result. Good parts are placed on the conveyor belt, reject parts in a rejects crate.

SKT is already planning the next extension of production, as the trend towards direct moulding of LSR seals onto carriers made from steel, aluminium or plastic is proceeding at a dramatic rate.

## INFOBOX

**Founded:** Sinsheimer Kunststofftechnik GmbH (SKT) in 2000

**Employees:** 150 in the SKT Group

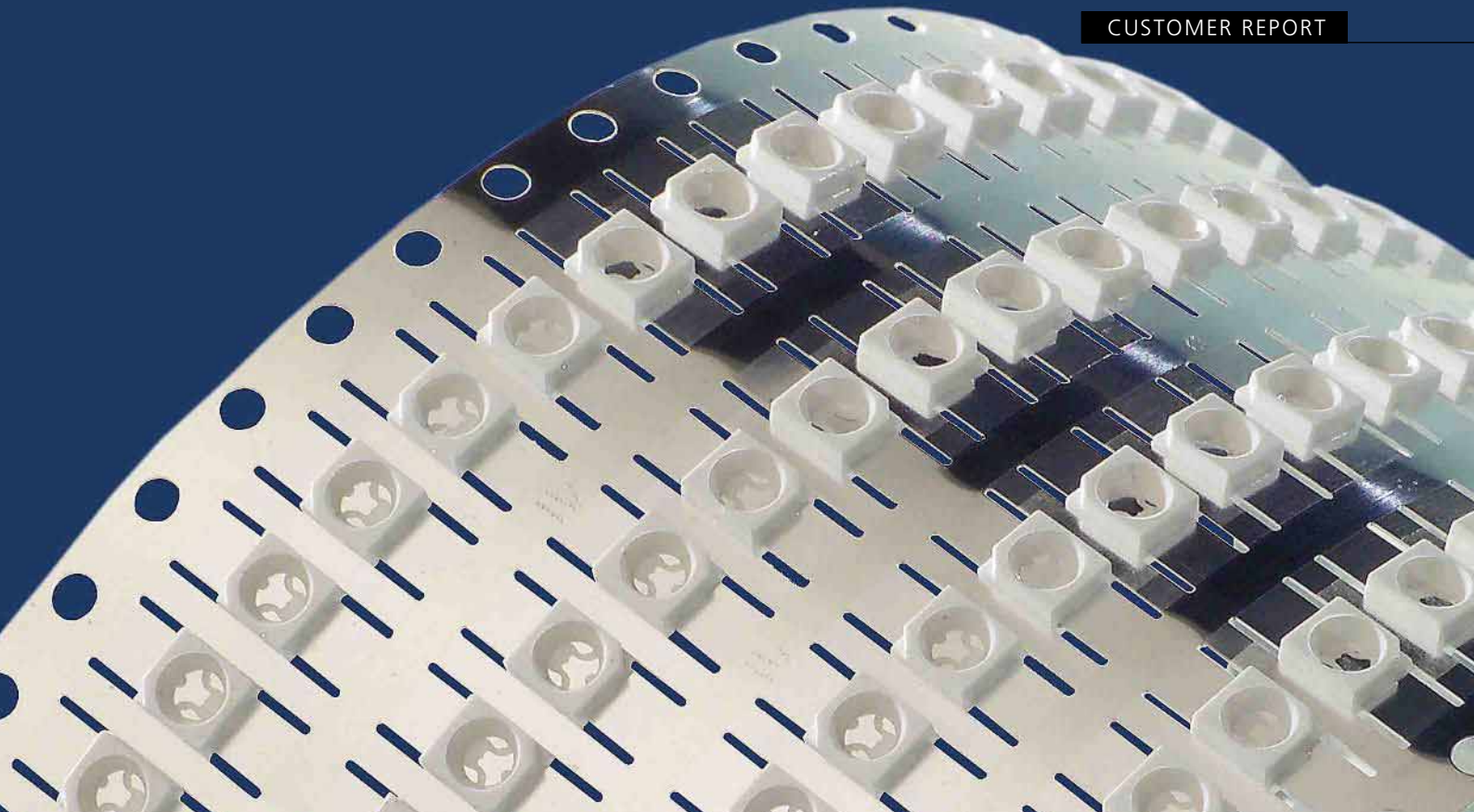
**Turnover:** 25 million euros for the SKT Group

**Machine fleet:** approx. 90 injection moulding machines with a clamping force range from 250 to 4,000 kN

**Products:** Production of thermoplastic parts and items made from silicone

Contact: SKT - Sinsheimer Kunststofftechnik GmbH, Kaiserstraße 1, 74889 Sinsheim-Weiler, Germany  
www.s-k-t.com





# Billionaires of micro-precision

**T**he speciality of Deutsche Technoplast GmbH is SMT (Surface Mounted Technology). The company based in Wörth/Donau, Germany has been producing SMT LEDs since 1989, the production volume of which has increased enormously from one million units per year at the beginning to over five billion today.

Thanks to these many years of experience, Deutsche Technoplast will next year celebrate its 20th production anniversary to coincide with the "40 years of the Wörth/Donau location" anniversary. In addition to the preparations for the celebrations and the day-to-day business, extensive building activities are also currently in progress in Wörth. With the completion of the new buildings for the quality assurance and warehouse areas, especially for in-house mould construction, the entire production area has more than doubled



with an additional area of about 3,300 square metres.

The company was founded in 1965 by Johann Bauer, the father of the present Managing Directors, Master of Industrial Engineering Birgit Bauer-Groitzl and her brother Hans Jürgen Bauer, Industrial Foreman for plastics and metal. A second location, the Deutsche Technoplast (M) Sdn. Bhd, began operation in 1993 in Melaka, Malaya, as important customers who further process Technoplast products are based there.

The production in Asia corresponds one-to-one to that in Germany where, however, the complete systems are put first into operation before they are used in Malaysia. Furthermore, a uniform quality standard is ensured by means of a contin-

Photo: Deutsche Technoplast GmbH



Photo: Deutsche Technoplast GmbH

uous transfer of know-how between the locations. "A great advantage for us here is that ARBURG is also present with a subsidiary in Malaysia and fast service is thus guaranteed," says Birgit Bauer-Groitzl.

The customers of Deutsche Technoplast GmbH traditionally come from the electrical engineering, audio electronics and optoelectronics sectors. These include large corporations such as Osram, Infineon, Siemens or Deutsche Bahn as well as companies from their region, for which standard moulded parts are produced.

The product range covers optoelectronic housings, lenses and other components, through to micro-components. The high-precision steel moulds required are developed and manufactured almost exclusively at the company's own mould construction facility.

With unit volumes in the billions, the main focus of production today clearly lies in that of SMT micro-components. The first steps towards this specialisation had already been taken by Technoplast in the early 1990s. At that time, in cooperation with the customer Siemens Semiconductors, new types of SMT LEDs for surface-mounted technology were developed out of the production of casting moulds (cavities) for LEDs mounted by means of through-hole technology.

The great challenge here was to integrate the casting mould and the insulation and reflection functions into a single component and, in addition, to create a sealed connection between organic plastic and inorganic base material. Whereas the casting moulds (which are still part of the Deutsche Technoplast product range today) have diameters between 3 and



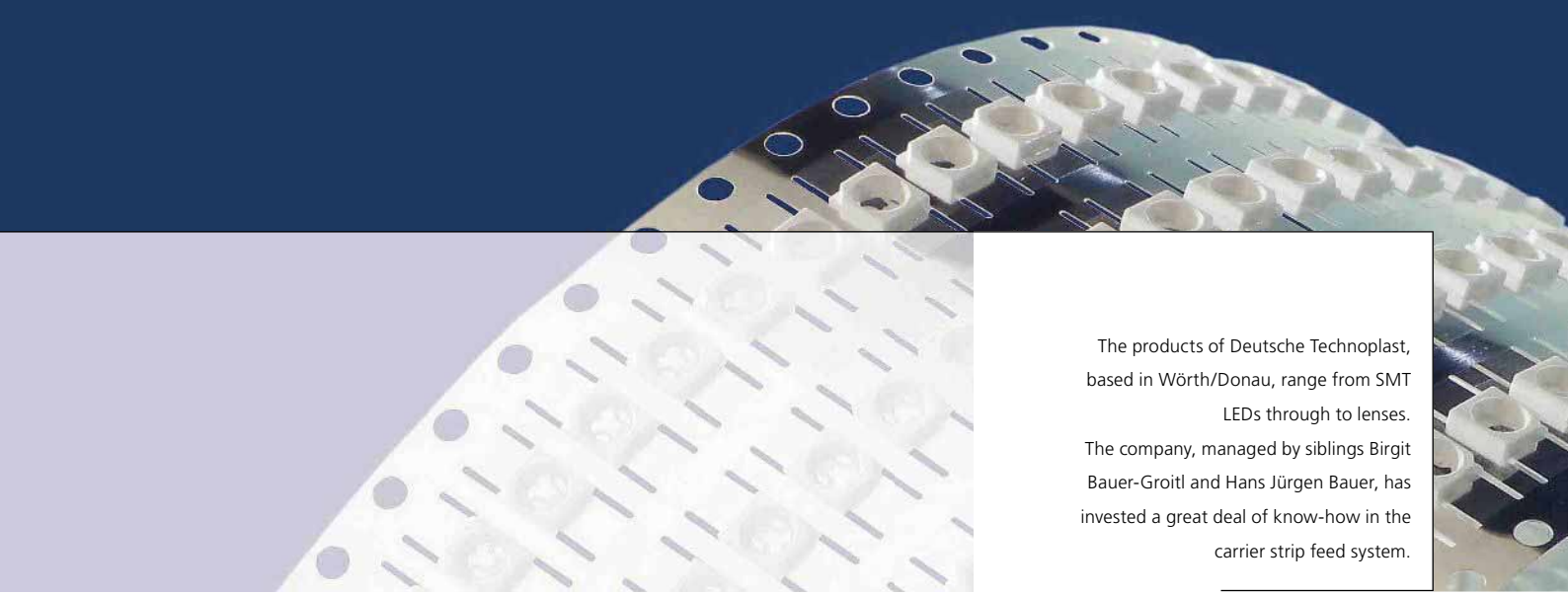
5 mm, the dimensions of certain SMT LEDs are as small as 0.6 mm.

With the entry into SMT production, Deutsche Technoplast has continuously expanded its know-how in the field of automation technology for the operation of the ARBURG injection moulding machines used in its plant: For example, the material feed of carrier strips for the so-called reel-to-reel process was an in-house development. Here, the metal strips are fed from a reel into the injection moulding machine (partly split into several strips), the plastic component is moulded on and the strip is then reeled up again.

And this is not the only clear demonstration of the company investing a great deal of its own know-how in the automation of the entire feed technology. This is now also being used in additional processes, for example, in automatic image recognition during quality control monitoring or in the printing of the carrier strips using the direct offset printing process.

Because it was not clear whether carrier strip feed to the mould would be

performed horizontally or vertically at the outset, ALLROUNDERS with pivoting clamping units were first used, with which both variants were possible. Today, the feed is exclusively vertical. The first contact with ARBURG took place in 1981, with the purchase of an injection unit which was used on an Eckert&Ziegler injection moulding machine. Even then, the modularity of the ARBURG injection units, with which changes between different materials can be easily achieved, was decisive. This argument is still valid today, as a wide variety of technical plastics are processed, including special types such as PPA, PMP or thermoplastic elastomers. In 1989, the first ALLROUNDER was purchased and in 1991 the first machine with a position-regulated screw. "Thanks to the hydraulic ALLROUNDERS which, even then were very dynamic high-precision, we had a decisive advantage over our competitors," recalls Managing Director Birgit Bauer-Groitzl. Today, the Technoplast machine fleet in Germany and Malaysia comprises a total of 50 ALLROUNDERS



The products of Deutsche Technoplast, based in Wörth/Donau, range from SMT LEDs through to lenses. The company, managed by siblings Birgit Bauer-Groitzl and Hans Jürgen Bauer, has invested a great deal of know-how in the carrier strip feed system.

with clamping forces ranging from 250 to 2,000 kN. The three newest machines are electric ALLROUNDER As. "Originally, we were rather sceptical about electric machines," says the plastics technology expert, "as we had doubts regarding the dynamics and we were also able to fully meet our customers' high demands for precision with our hydraulic machines featuring a position-regulated screw. However, tests have taught us otherwise and

production hall. In order to be able to use the machines in the reel-to-reel process, they were specially adapted to the Technoplast requirements.

The fact that, in addition to the micro-components produced in the reel-to-reel process, lenses are also injection moulded, whose production with regard to cycle time, temperature and material represents the direct opposite of the above-mentioned process, is proof of the company's high level of expertise in applications technology. The success of the company is reflected in the high utilisation of production, in which three shifts are worked on weekdays and two shifts at weekends. Further indications are the extensive building activities at the German location and the continuing growth of the workforce. At present, the company has more than 100 employees in Germany and a further 50 in Malaysia. "We place great importance on committed employees who are prepared to take on responsibility," explains Birgit Bauer-Groitzl. Only with such a team and together with continuous process monitoring and 100-percent visual inspection, can it be ensured that only absolutely flawless products leave the factory.

The customer orientation also substantiates the fact that the company is not satisfied with just certification according to DIN 9002:1994 and DIN EN ISO 9001:2000. Additional certification according to ISO TS 16949:2002 is planned for February 2009, for example.

The automotive industry is not a direct customer. However, Deutsche

Technoplast wishes to understand the requirements that its customers must fulfil as automotive suppliers, in order to be able to continue to provide 100-percent satisfaction in the future.



we now fully appreciate the advantages of the electric machines." A high plasticising capacity could be easily achieved, while maintaining good dynamics. This is necessary, considering that the number of cavities per mould has increased dramatically from 18 initially, to several hundred today. As an additional advantage, the Managing Director emphasises the low noise emission levels of the electric machines, which becomes clear in the vicinity of the ALLROUNDER A machines, during a tour of the Technoplast



## INFOBOX

**Locations:** Germany und Malaysia

**Employees:** over 100 in Germany, about 50 in Malaysia

**Products:** optoelectronic housings, lenses and other components made from high-grade technical plastics through to micro-components, SMT carrier strip processing and printing as speciality

**Machine fleet:** 50 ALLROUNDERS with clamping forces from 250 to 2,000 kN

**Contact:** Deutsche Technoplast GmbH, Reitfeld 2, 93086 Wörth a. d. Donau, Germany  
[www.technoplast-group.com](http://www.technoplast-group.com)



to



**1** 839 saw the birth of what is today a worldwide corporation known under the name of B. Braun. Braun manufactures medical technology products, such as the “Braunule”, for example, which gave its name to a groundbreaking product throughout the entire industry. In Escholzmatt in Switzerland, predominantly infusion accessories such as reusable valves, syringes and industrial products are produced. 38 ARBURG injection moulding machines, of which eleven electric ALLROUNDER As are used.

B. Braun is represented in over 50 countries as a globally-operating family business with over 35,000 employees. In Switzerland, B. Braun Medical AG’s production plants include the one at Escholzmatt. Within the corporation, this location is seen as a Centre of Excellence (CoC). The CoC status means that, in addition to responsibility for the development and production of certain products, individual specific processes of B. Braun Production Systems are also supported from Escholzmatt.

The production facility was last expanded in 2006 and currently covers 3,100 square metres, for class D clean room alone.

The customers for the products are exclusively from the medical sector. In Escholzmatt, different versions of reusable valves are produced, including the high-end product Discifix C® with significantly increased pharmaceutical resistance. The product portfolio is supplemented by perfusor syringes with volumes > 50 millilitres, which are used for pump systems and for flushing and injection applications, as well as semi-finished components and other industrial products. PE and PP make up the largest proportion of processed materials.

All production processes are validated for series production before being released. Parallel to this, extensive production monitoring tests are performed and evaluated on a batch basis using statistical methods. The implemented quality management system also fulfils the requirements of the American authority FDA.

The cooperation between ARBURG and B. Braun in Escholzmatt goes back to the end of the 1970s. It is therefore no surprise that, from a total of 52 injection moulding machines, 38 are from ARBURG.

Anton Deisser, Plant Manager in Escholzmatt, explains the main reasons for investing in high-end ALLROUNDER A machine technology: “The main advantage of the electric machines is the significantly lower energy consumption. But also the high degree of reproducibility, the option for simultaneous movements and not least the low noise emission levels played an important role in our decision. Especially for use in air-conditioned clean rooms, the

low environmental impact due to particles and waste heat is important.”

Here, the water-cooled motors, closed drives and spindle systems of the ARBURG machines offer distinct advantages. The ALLDRIVE machines are used especially for the production of semi-finished components for the Discifix C product range. The precise and protective production method contributes to process-reliable achievement of the high technical require-



ments placed upon the reusable valves (pressure-resistant, rotatable press-fit connections with high stress-crack resistance to aggressive media).

In addition to a good price/performance ratio, the ALLROUNDER machines also impress with their technical features. These include the hydraulic nozzle system which, if required, permits cost-effective retrofitting with hydraulic core pulls, or the option to use the moulds from other ALLROUNDER machines. The data record compatibility of the SELOGICA

# Medical technology perfection



Photos: B. Braun Medical AG

**B | BRAUN**  
SHARING EXPERTISE

Clean: In the Escholzmatt plant in Switzerland (left), B. Braun Medical AG produces medical technology products such as reusable valves, syringes and industrial products using eleven ALLROUNDER A machines (right).

control system make this possible. Some ALLROUNDER machines are equipped with assembly robots, which are directly coupled to the machines and thus form integrated production cells.

In Escholzmatt, they are extremely satisfied with ARBURG injection moulding technology. Anton Deisser: "The ALLROUNDERS have proved to be very robust and reliable. Even in production using moulds bordering on the limits specified by ARBURG, constant production without a noticeable increase in wear is possible. Especially on the ALLDRIVE machines, the routing of all lines within the machine base is of advantage. The injection and clamping units are protected by housings that facilitate efficient cleaning and which reduce particle contamination of the clean room due to the machines. Support during the quotation and after-sales phases through fast and pragmatic help, can only be de-

scribed as very good." In purchasing the ALLROUNDER A machines, medical technology regulations were also of decisive importance for B. Braun Medical AG. These were implemented by ARBURG in a practical solution for both sides. This significantly facilitated qualification of the processes on these machines, resulted in shortening of the validation and so, ultimately, led to important financial savings.



## INFOBOX

**Founded:** Escholzmatt plant, 3 September 1973

**Employees:** over 800 employees in Switzerland, of which about 200 in Escholzmatt

**Turnover:** 267.1 million CHF (167 million euros) in 2007

**Machine fleet:** 52 injection moulding machines, of which 38 ALLROUNDERS

**Products:** reusable valves in various versions, perfusor syringes and industrial products

**Contact:** B. Braun Medical AG, Hauptstrasse 39, CH-6182 Escholzmatt, Switzerland, [www.bbraun.ch](http://www.bbraun.ch)



# TECH TALK

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

# Controlled mould

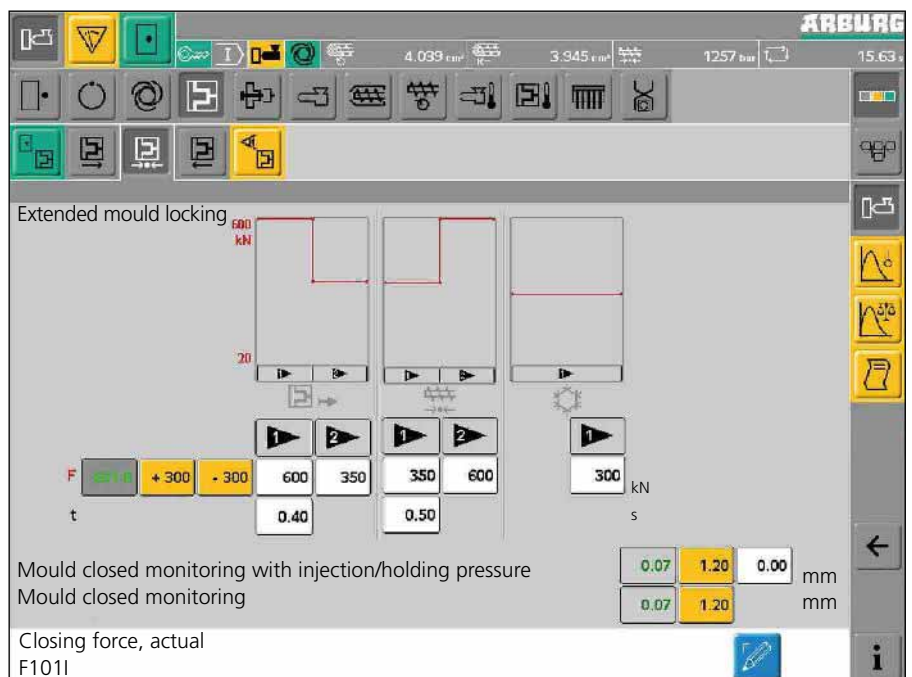
**T**hose who wish to comprehensively utilise and master high-performance machine technology, require an intelligent machine control system. With its intuitive graphic sequence programming, SELOGICA forms the ideal basis for this purpose. It is designed to control and optimise the injection moulding process according to requirements. A good example of this is the "Extended clamping programme", which is available on electric ALLROUNDER A machines and on all hydraulic ALLROUNDERS with dual-pump technology. But what exactly does this function offer?

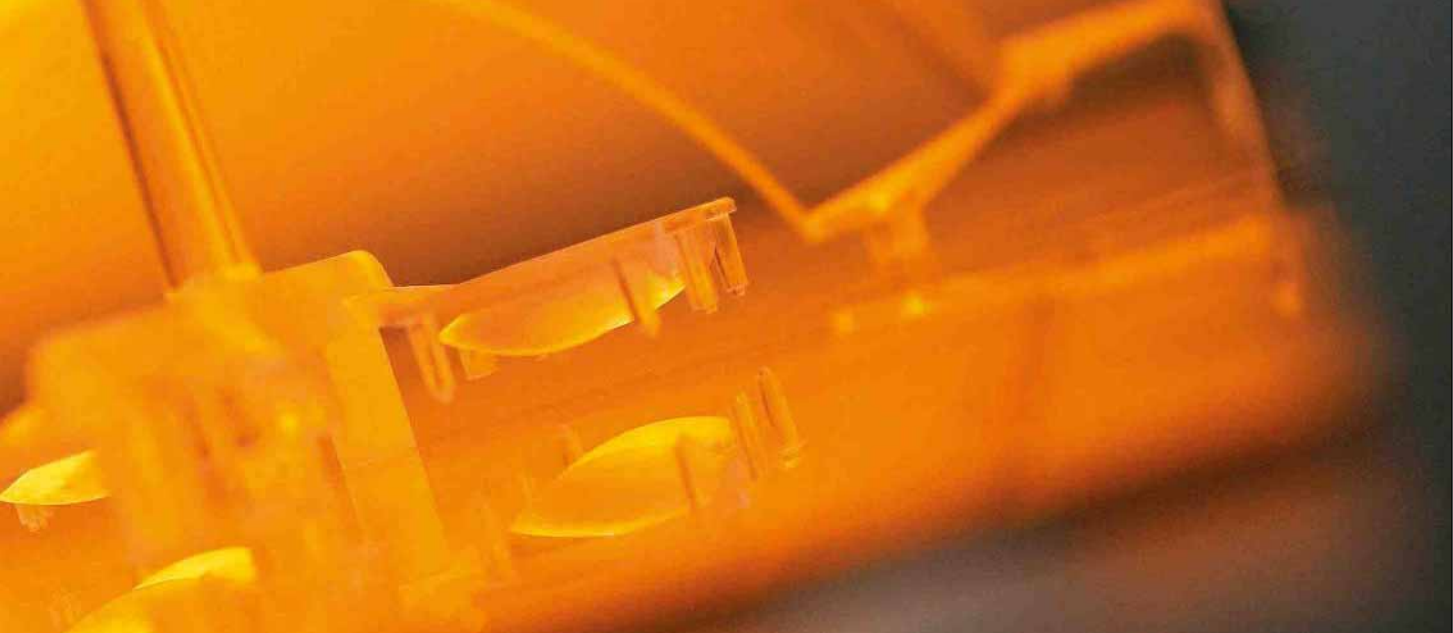
On hydraulic machines with only one pump, the injection process starts once the locking force has been achieved. The pressure built up in the hydraulic cylinder of the clamping unit for this purpose is generated via valves and only dissipated at the end of the remaining cooling phase. During the injection moulding process, no further control of mould locking is possible. This is only possible if the hydraulic drive is equipped with at least two pumps and, therefore, two functions can be performed simultaneously.

However, due to the independence of the electro-mechanical direct drive, the electric ALLROUNDER A machines are generally capable of performing sev-

eral functions simultaneously. Because the clamping unit is designed as a toggle system, the locking force is always dependent on the mould installation height. This can change during operation due to heat expansion of the mould, so that the locking force also changes. In this case, clamping force control provides for fully-automatic compensation of the heat expansion, by adapting the mould installation height during the ongoing process via mould height adjustment.

But what advantage does that have for the injection moulding process? In addition to the "Extended clamping programme", up to two locking forces can be programmed during the injection, holding and remaining cooling phases respectively. This enables micro-stamping or so-called "active breathing", for example (photo, left). Here, the locking force is deliberately reduced at the end of the injection phase, permitting pressing open of the mould in the hundredths of a millimetre range



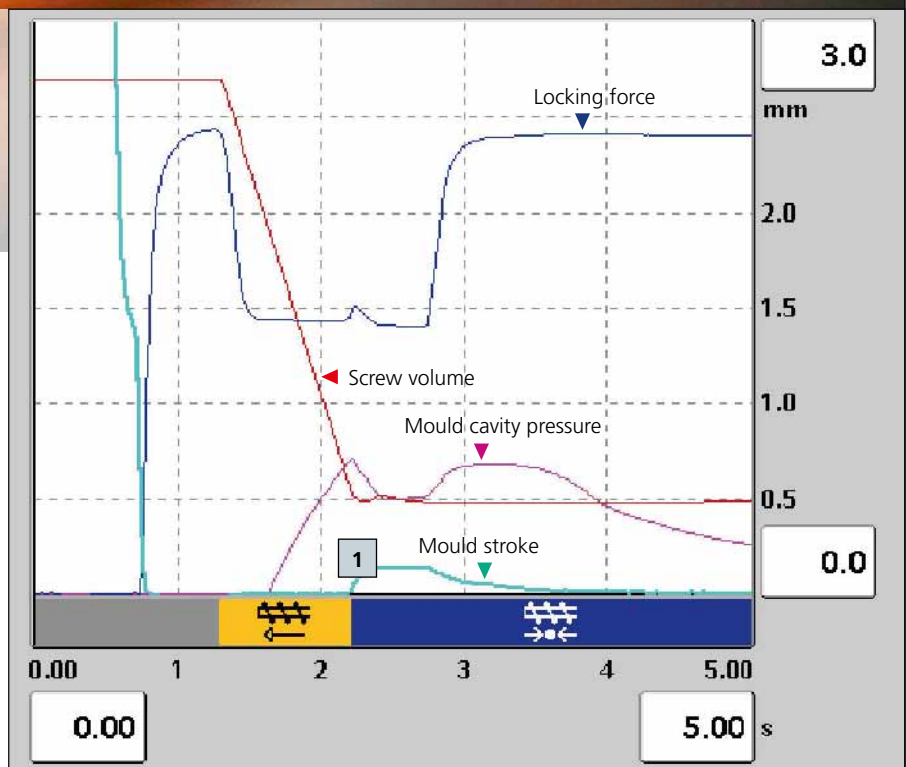


# locking

with increasing internal mould pressure: In this way, the mould “breathes” slightly (curve point 1, photo, right). This results in small overfeeds, as the boundary layer of the moulded part was already able to cool down and the plastic remains in the cavity. During the holding pressure phase, the locking force is increased again and the mould closes completely. The result is a minimal stamping stroke in which the holding pressure acts on the entire surface of a cavity. This enables the reduction of stresses in optical components and increases the flatness of planar moulded parts. In the case of moulded parts which are subsequently electroplated, improved adhesion and therefore higher quality can be achieved.

Whether active breathing can be applied, depends largely on the part geometry and the mould design. The process is particularly suitable for rotationally symmetrical moulded parts. A special stamping mould is not required. Due to the stamping process, the moulded parts are more tightly packed and the result is increased part weights. On the other hand, shrinkage of the parts is also reduced, which must be taken into account in the mould design.

Another interesting option offered by the “Extended clamping programme”, is the process-dependent support of mould venting. At the start of the process, a rela-



tively low locking force is programmed so that when the mould is closed, the air in the cavity can escape as the mould fills. In order to exclude overfeeding, the locking force must however be increased again just before the cavity is completely filled with plastic and the internal mould pressure increases. In addition to improved mould filling, the so-called diesel effect, localised burning of the plastic, can be prevented. The overall cycle time is not increased with this type of venting.

The individual parameters for active breathing or venting can be perfectly harmonised via the freely configurable process graphics of the SELOGICA control system. This enables easy and quick optimisation of the entire process.

Polarised light clearly shows stresses in optical components (top). These can be reduced by extended mould locking (left). For this purpose, a minimal stamping stroke is programmed (right).



**International turnkey projects.** Modular ALLROUNDER injection moulding technology and MULTILIFT robotic systems, combined with a highly-qualified project team make ARBURG the perfect partner for complete turnkey projects. We provide support for complex production cells, often in conjunction with our sophisticated multi-component technology, from the conceptual planning phase and the design of the system and the mould, through to approval and initial pilot production - and all this available worldwide.



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