

today

The ARBURG magazine

Issue 31

Spring 2006



50 years of ARBURG
injection moulding machines

4	Anniversary
	50 years of innovative technology
8	Golden Edition
	Anniversary gold
11	Training
	Experts exchanging ideas
12	Customer report
	PKT: small parts in grand style
14	Projects
	uvex: well protected, thanks to plastic
16	Customer report
	Hunter: the Rainmakers
18	History
	Milestones
19	Tech Talk
	Processing thermosets reliably



MASTHEAD

"today", the ARBURG magazine, Issue 31, Spring 2006
 Reproduction – even in part – only by express permission
Responsible: Dr. Christoph Schumacher
Editorial advisory board: Juliane Hehl, Martin Hoyer, Herbert Kraibühler, Bernd Schmid, Jürgen Schray, Wolfgang Umbrecht, Renate Würth
Editorial team: Uwe Becker (text), Markus Mertmann (photo), Oliver Schäfer, Ralph Schreiber (text), Vesna Sertić (photos), Susanne Wurst (text), Peter Zipfel (layout)
Editorial address: ARBURG GmbH + Co KG, PO box 1109, 72286 Lossburg
Tel.: +49 (0) 7446 33-3149, **Fax:** +49 (0) 7446 33-3413
e-mail: today_kundenmagazin@arburg.com, www.arburg.com



In 1956, ARBURG introduced its first series-produced machine on the world market for the injection moulding of plastics. In 2006, this golden anniversary will be celebrated worldwide under the motto "50 years of ARBURG injection moulding machines."





Dear Readers,

We celebrate a big anniversary in 2006. Fifty years ago, we started series production of plastic injection moulding machines in Lossburg.

So naturally, ARBURG's annual slogan for this year is: "50 years of ARBURG injection moulding machines". This is a year for us to celebrate a success story spanning five decades – an outstanding example of the German economic miracle of the 1950s. Here at ARBURG, the festivities of this year's anniversary are marked by a respect for the achievements of the founding generation, gratitude towards our customers for their loyalty and our sense of commitment to the future.

Wherever you celebrate this anniversary with ARBURG, you are a part of the ARBURG global family.

Above all, we are also celebrating the many years of trust and intensive cooperation with our customers and partners. After all, your success is what drives us

and is also the basis of our success, for over fifty years now! On behalf of the partners, the management and the entire staff, I wish to take this opportunity to express my gratitude for your confidence in our company.

Without you, such a golden anniversary would not have been possible.

Fifty years ago, who could have predicted such success for this small family-run business from the northern Black Forest? We are certain - nobody!

And, in all modesty, that makes us very proud!

And as in the last five decades, you can continue to rely on our consistent long-term strategy in the future.

True to our company maxim, we are your "Allrounder for economical injection moulding".

We hope you enjoy reading our first anniversary issue!

Yours,

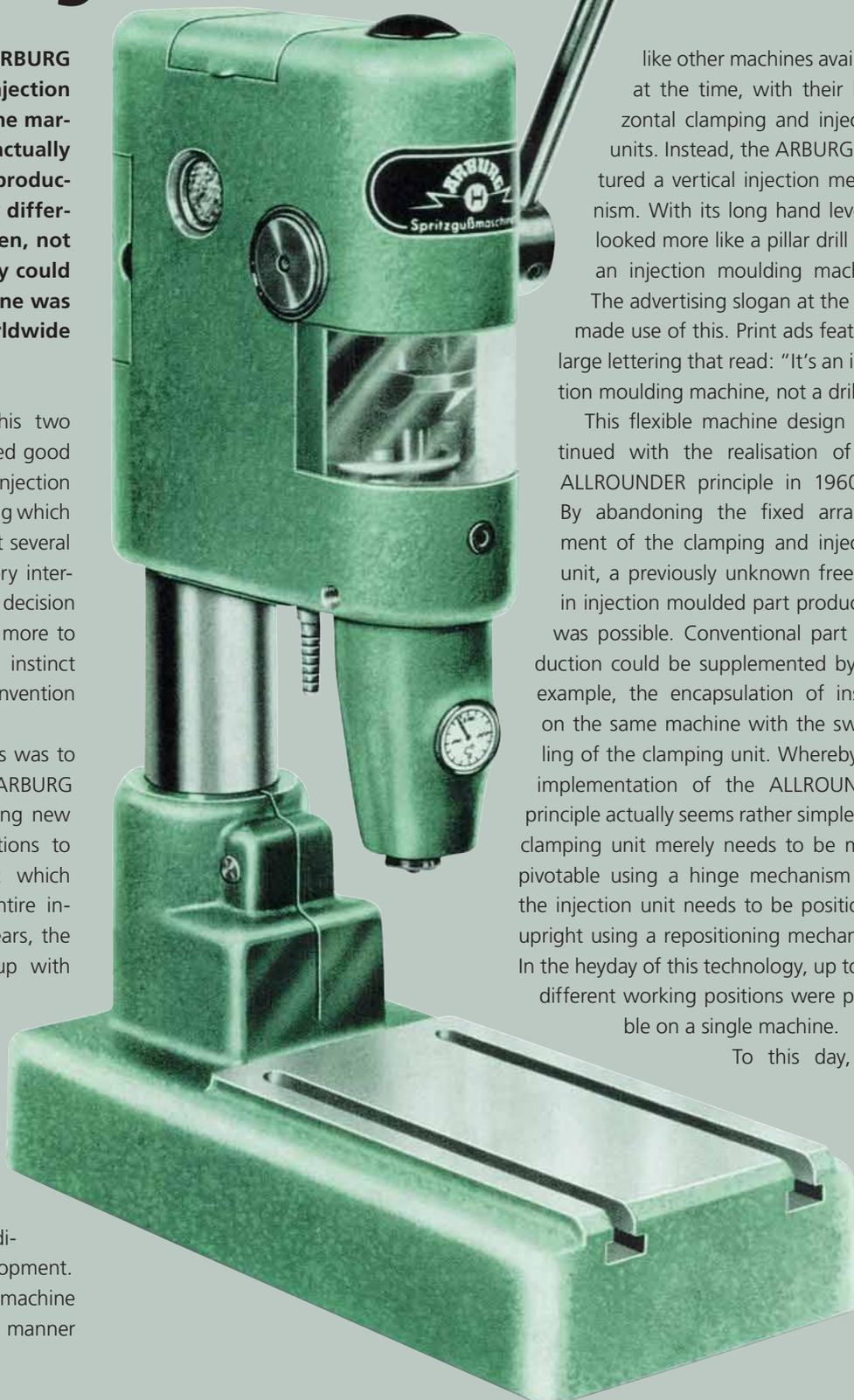
Renate Keinath

50 years of inno

Exactly fifty years ago, ARBURG put its first small injection moulding machine on the market, a machine which was actually designed to solve internal production problems in a completely different field of business. Back then, not even the founding Hehl family could have foreseen that this machine was to form the basis of a worldwide company success story.

Certainly, Arthur Hehl and his two sons Eugen and Karl demonstrated good business sense in pursuing the injection moulding machine idea. Something which was not least due to the fact that several customers and suppliers were very interested in the design. However, the decision to produce the machine had far more to do with technical and business instinct than with the expectation of an invention which founded an era.

But in the following years, this was to change fundamentally, because ARBURG was able, time and again, to bring new technical highlights and innovations to the injection moulding market which were groundbreaking for the entire industry. Throughout these fifty years, the technicians in Lossburg came up with solutions which were, and are, so unique that they are today still protected by international patents. The ALLROUNDER principle can be considered another great milestone in the history of ARBURG technology. This innovation, as many others, had its roots in the tradition of ARBURG machine development. That's because the first ARBURG machine did not operate in a conventional manner



like other machines available at the time, with their horizontal clamping and injection units. Instead, the ARBURG featured a vertical injection mechanism. With its long hand lever, it looked more like a pillar drill than an injection moulding machine. The advertising slogan at the time made use of this. Print ads featured large lettering that read: "It's an injection moulding machine, not a drill!"

This flexible machine design continued with the realisation of the ALLROUNDER principle in 1960/61. By abandoning the fixed arrangement of the clamping and injection unit, a previously unknown freedom in injection moulded part production was possible. Conventional part production could be supplemented by, for example, the encapsulation of inserts on the same machine with the swivelling of the clamping unit. Whereby the implementation of the ALLROUNDER principle actually seems rather simple: the clamping unit merely needs to be made pivotable using a hinge mechanism and the injection unit needs to be positioned upright using a repositioning mechanism. In the heyday of this technology, up to ten different working positions were possible on a single machine.

To this day, the



vative technology



ALLROUNDER principle remains special in the field of injection moulding technology, say Eugen and Karl Hehl, Senior Executives of ARBURG. With today's so-called "U versions" of the ALLROUNDER, the four basic working positions can still be utilised. This advanced technological universality remains without equal to this day.

ARBURG also played a significant role in developing processing techniques used around the world. In 1961, ARBURG technicians were occupied, so to speak, as "pioneers" with the injection of several plastics on a single machine. The solution developed at ARBURG, which logically was based on the ALLROUNDER principle, was to use two separate injection units to inject both materials into a staged mould which is rotated mechanically. Multi-component injection moulding was invented.

A telephone dial represented an important step along the path of innova-



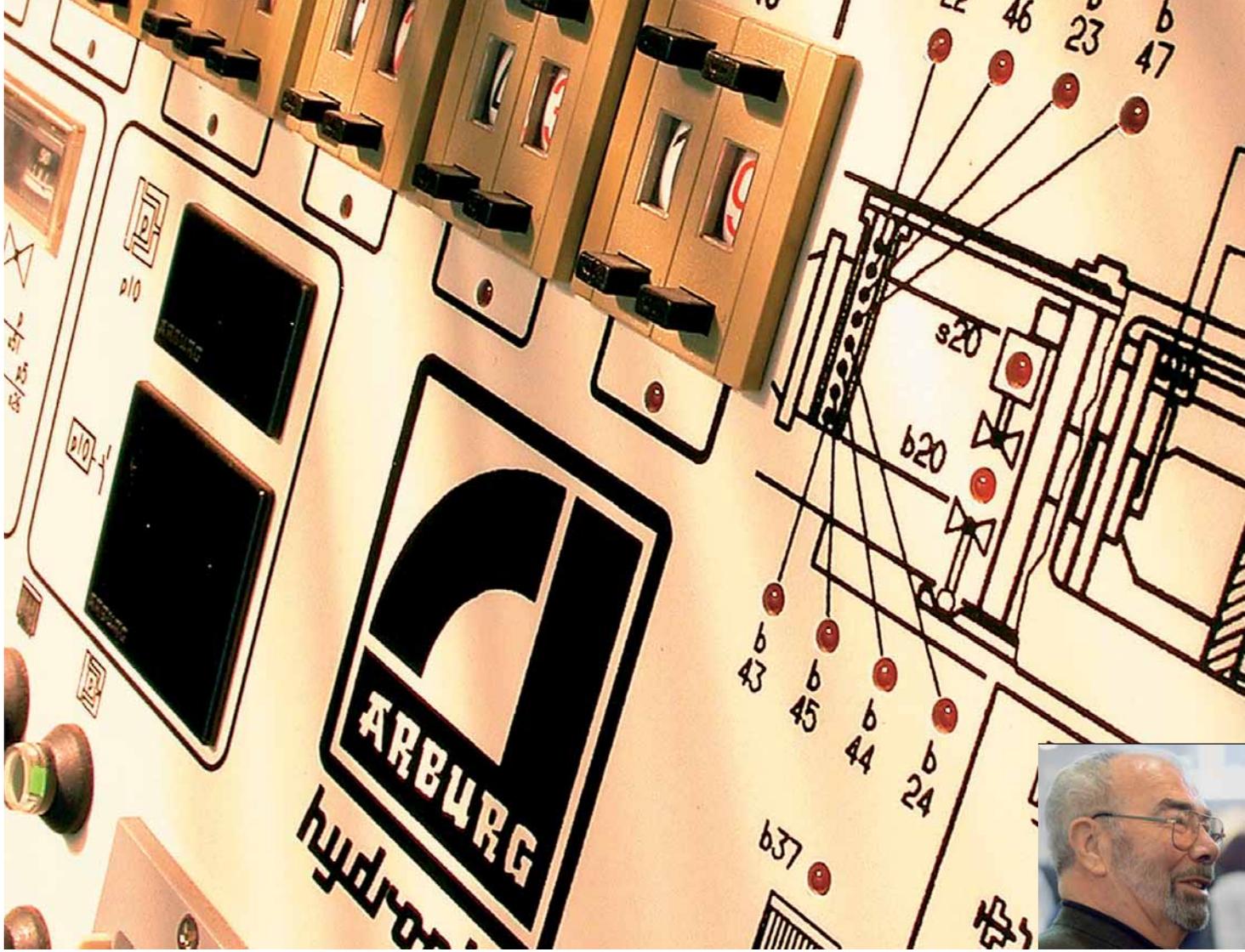
50 years of ARBURG
injection moulding machines

tion. This moulded part was produced entirely automatically for the first time at ARBURG in 1962 - a world first. The first component was injected, the mould insert was rotated by means of a rotating platen, the second component was added and the finished part was demoulded via an ejector. This principle, which was also patented at the time, basically remains the same to this day. By this time, up to six components could be processed fully automatically on a single machine. The high capabilities of the ALLROUNDERS, moulds and control systems made it possible to do so without difficulty.

On the subject of control technology, this is another area where ARBURG made its presence felt. Here again, state of the art technical developments in this area were initiated time and again, which lastingly facilitated adjustment and programming and thus the production of moulded parts. 1972 was the year in ARBURG's history in which new control system standards were set. A fully electronic controller for injection moulding machines was introduced at ARBURG with the first PolytronICA on an ALLROUNDER. The world's first standard microprocessor controller was used by ARBURG in the ALLROUNDER H from 1975 onwards. The main difference lay in the use of a microcomputer system, the benefits of which lay in its programmed command structure. The next step was to follow on quickly - the first machines with graphical user interfaces were the ALLROUNDER 305 ECO in 1983 and the ALLROUNDER 170 CMD. Machine parameter settings could be entered, checked



Problem, visionaries and solution united: Metal and plastic plugs for flash units, Eugen, founder Arthur and Karl Hehl (above, from left) and the first ARBURG series-produced machine.



and for the first time continuously monitored and stored via the monitor. From the HydronICA D, MultronICA and DialogICA multi-processor controllers, the development ultimately led to today's SELOGICA controller generation. This high-performance "machine control centre" with LCD colour monitor and graphical process management using sequence diagrams with icons is standard on all machine types. Another operating alternative, SELOGICA 'direct', has been available since 2004. SELOGICA 'direct' combines all

function keys on a single touchscreen and features increased utilisation of tables and additional graphical elements.

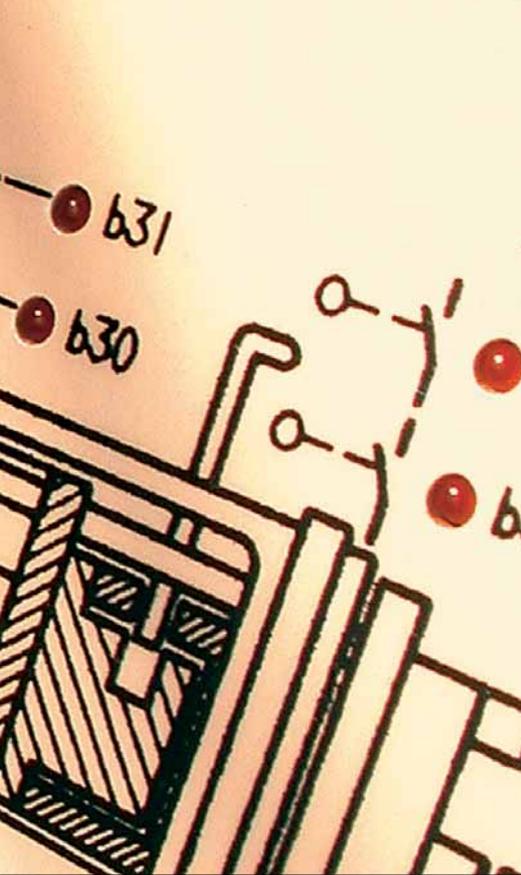
A truly groundbreaking development which was far ahead of its time was the CMD machine series introduced by ARBURG in 1983, as Eugen and Karl Hehl recall. From the start, these machines featured modular design and construction, with the aim of achieving a high degree of automation for all necessary machine sequences. The initials CMD stood for "Computer Monitor Dialog", whereby the computer was responsible for the control, adjustment and monitoring of the machine, while the monitor served as a display for data and functions. The 170, 270, 370 and 470 CMD types were produced at the end of the 1980s. The peripheral devices for automation were perfectly adapted to the machines and were developed together with the machines from the start. When

fully equipped, it was possible to assemble an automatic production cell which, in addition to several machines, also consisted of a central transport system, automatic changing of the mould, cylinder and container with paternoster set-down, hydraulic quick clamping of the moulds and automatic material supply.

The entire system was controlled via a host computer, the basic functions of which can still be found on the current ARBURG ALS host computer system. With their innovative technology, the ALLROUNDER CMD machines provided the inspiration for a number of subsequent technical developments at ARBURG, such as modular injection units, the automation of the injection moulding process and also control technology.

Closely linked with the topic of automation is the groundbreaking VARIO principle, brought to market by ARBURG in 1989. The initial "V" in the name ALLROUNDER "V" name pays homage to this new technology, which also made it possible to inject into the parting line





50 years of ARBURG
injection moulding machines

with a horizontal injection unit. This also enabled linear form filling to be achieved. The ALLROUNDER V permitted this through the horizontal movement of the injection unit within a defined area. Characteristic of this machine was the slot in the fixed clamping platen, in which the injection unit could be moved to allow offset injection.

There are many more noteworthy technologies which ARBURG has produced in its fifty year history. Some representative examples of these are powder processing, or the ALLROUNDER A with its servo-electrically driven main axes and optional hydraulic or electric auxiliary axes. Here again, ARBURG's universal philosophy of modularity plays the crucial role. Because it is the appropriate combination of drive systems which makes it possible to have



a machine individually adapted to the operating requirements, culminating in a fully electric ALLROUNDER.

Looking at the technological achievements of the company and its principal philosophy over the last 50 years, one thing becomes clear: at ARBURG, theory must always be borne out by practical benefit in order to create functioning solutions which could also be sold. The measure for the ideas, developments and technologies which can be created in order to further an industry such as plastics processing, was always the customer, say Eugen and Karl Hehl looking back.

ARBURG has held this principle close to its heart, right from the very beginning. Otherwise, no one would have shown any interest in the small, hand-operated vertical injecting machine from Lossburg for encapsulating small inserts.

Photo, top: With all of its developments, ARBURG has always focussed on the customer.

Today, the company is in the care of partners Karl and Eugen Hehl, Renate Keinath, Juliane and Michael Hehl (from left).



ARBURG
ALLROUNDER 420 C
GOLDEN
EDITION

GOLDEN
EDITION

Annive

Gold has been the metal of the gods and a symbol for extraordinary performance since time immemorial. On the occasion of our golden anniversary celebrating "50 years of ARBURG injection moulding machines", the name for our anni-

versary gift was quickly found - a specially-designed machine series: the ALLROUNDER C GOLDEN EDITION.

These very special ALLROUNDERS embody 50 years of expertise in machine and process technology, combining selected

technical features from the latest ARBURG product generation, in the anniversary machine series. With its high-quality standard equipment, this anniversary model features a highly attractive price-performance ratio. Both the modern SELOGICA 'direct' control alternative and the highly



rsary gold



50 years of ARBURG
injection moulding machines

wear-resistant cylinders are designed to meet modern production requirements, and the new switching valve technology guarantees superior moulded part quality.

The practical clamping forces available are the result of five decades of experience in injection moulding. The five ma-

chine versions, the 270, 320, 420, 470 and the 570 C GOLDEN EDITION, are available with clamping forces ranging from 400 to 2000 kN.

The high-quality basic equipment package is enhanced by a practical, fixed options package which was designed ex-

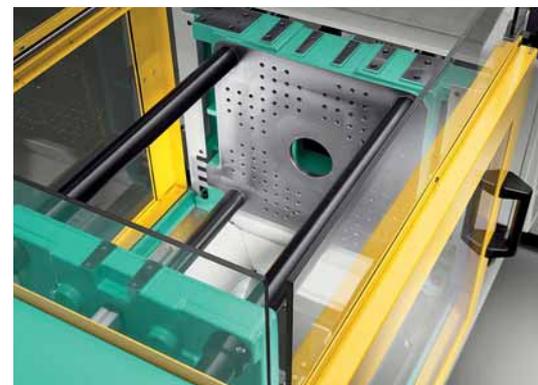


clusively for the anniversary model. With this, the individual configuration requirements of customers can be met in an ideal fashion. For the customer, this means that rapid planning and delivery times are also guaranteed thanks to the strictly defined options list.

The GOLDEN EDITION also sets standards in terms of control technology which are befitting of a special anniversary machine. The modern SELOGICA direct control alternative is designed for harsh operating environments and is offered as standard equipment. A 15-inch colour touchscreen monitor offers convenient operation. Graphical direct access fields and a permanently-visible structure path allow for simple navigation. The intuitive user navigation is an elementary feature of the time-proven and user-guided SELOGICA operating principle. Additional highlights of the SELOGICA 'direct' operating alternative are the chipcard access authorisation and the compact flash data storage.

In addition to its premium equipment package and the latest control system, the ALLROUNDER C GOLDEN EDITION impresses with its high degree of ergonomic functionality. Great emphasis was placed on optimal accessibility of all machine components, The open top safety guard

allows for easier access and fast mould replacement. The modular design also allows for simple maintenance – that saves time and money. And not just in terms of the purchasing price. Even following initial purchase, the anniversary machine continues to impress by offering an outstanding price-performance ratio, while improving production performance.



An open-top safety guard provides quick and simple access for changing moulds.





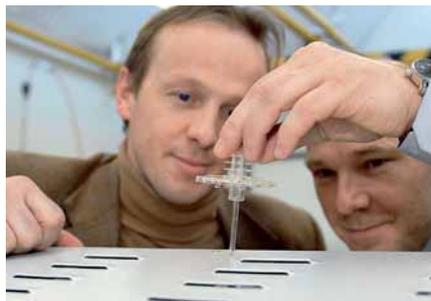
Eberhard Lutz, German Sales Manager, greeted members of the BASF sales staff at the start of the seminar in Lossburg.

Experts exchanging ideas

People at ARBURG had been looking forward to the dialogue with BASF AG for a long time. 50 international sales employees of this Global Player met on 11 January 2006 with representatives of the ARBURG training team to discuss the latest developments in the areas of injection moulding technology and materials.

The universal consensus at the end of this informative day was that both sides were able to gain valuable new insights from a productive ten hour meeting. It came as no surprise that the synergy between the two parties was so unusually high in Lossburg during the meeting. The expertise of the material producers' representatives was impressive, and yet in turn they were impressed with the presentation of the technological possibilities offered in the injection moulding sector.

Also well received was the presentation given by six people from the ARBURG seminar team on the effects on material and moulded part quality, due to altering relevant processing parameters such as temperature or moisture. Adverse



effects such as stresses in or also scorching on the moulded part (diesel effect) may occur as a consequence of insufficient material preparation or material processing.

During the concluding factory tour, the group of BASF employees were greatly impressed with the high degree of in-house manufacturing at ARBURG, which at 60 percent is unusually high, and also with the exemplary cleanliness of the production areas. As was plausibly demonstrated, this represents the normal condition of the plant and not something which had been prepared especially for the visit.

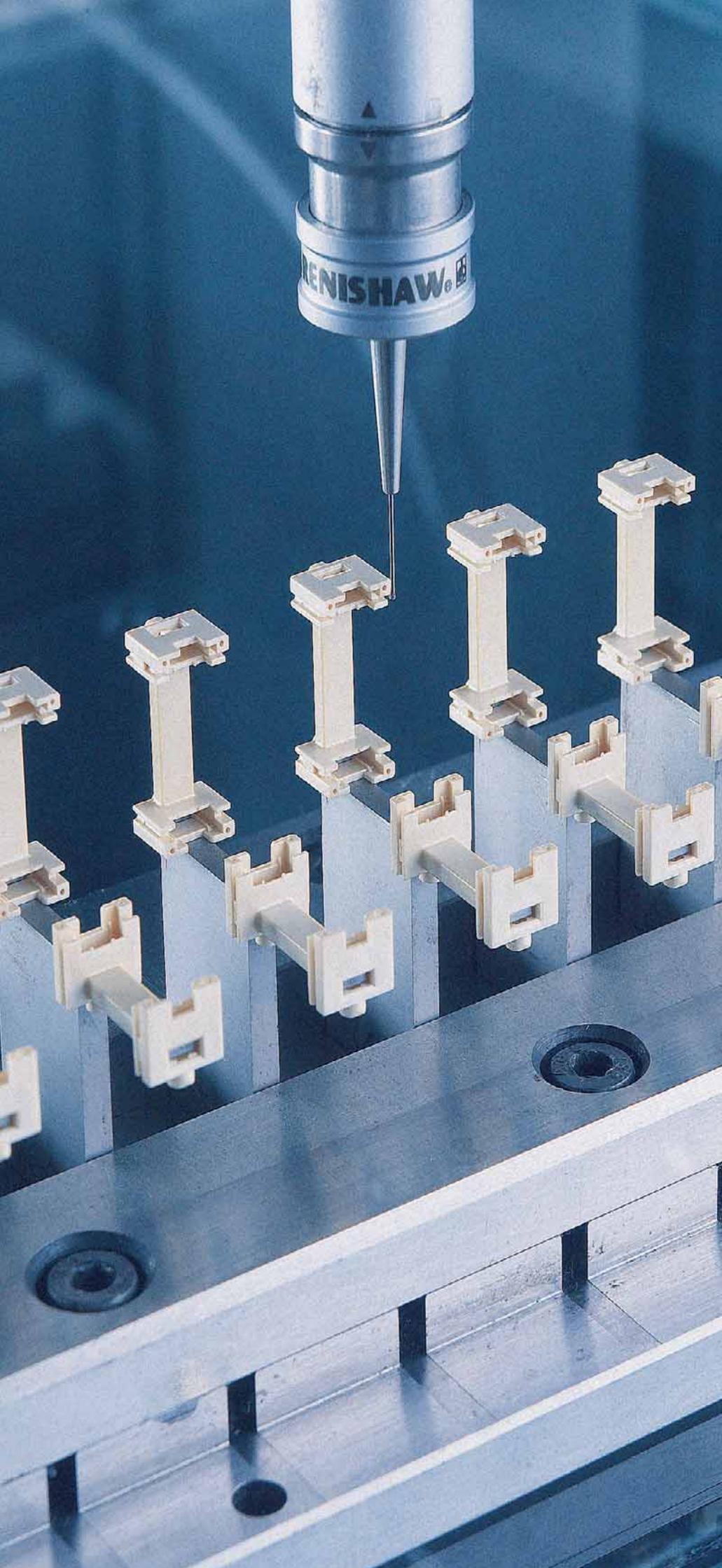
The day's varied programme unfolded for both sides in a very pleasant, casual atmosphere which was marked by impressive organisation and a tight schedule. That's no wonder in light of the successful history of cus-



tommer training at ARBURG, where so far around 65,000 participants have been trained since 1969.

From all participants, it was clear to see that both parties were enjoying the mutual learning process during what was both an informative and certainly strenuous conference. The entire event took place in a friendly atmosphere. Everyone had certainly learned something, even the highly-qualified ARBURG customer training team.





Not only are the products of PKT Präzisions-Kunststoffteile GmbH small, the company also had rather small beginnings back in 1969. Walter Spielmann, company founder and one of two Managing Directors, produced the company's first precision plastic parts in a garage.

Between Pforzheim and Stuttgart and only 35 kilometres from Stuttgart Airport lies Tiefenbronn, where this producer of small parts now has its headquarters. The company's proximity to the airport is particularly important, as PKT is dedicated to doing business in Germany and thus produces there exclusively, yet it has a worldwide clientele hailing from precision engineering, IT, electronics, automotive and medical technology industries. These intricate, highly-precise microparts from Swabia are also appreciated in Asia. PKT has long since grown beyond its humble origins; and nowadays one sees a successful company with 80 employees that has been through five facility expansions, thus proving that not only in terms of floor space, the days of operating from a garage are long gone.

In addition to the quality of its injected parts, the company's mould production expertise plays a crucial role in its success. At PKT, all moulds are produced in-house. This guarantees not only consistent production quality, but also a key technological advantage over the competition. Managing Director Rainer Gille sees leading technology as the main selling point for moulds and parts, and not low price.

PKT
Präzisions-Kunststoff-Teile GmbH

Small parts in grand style



Photos: PKT

The high-precision moulded parts weigh between 0.002 and approximately 30 grams and fall under the categories of free-falling plastic parts, two-component parts and continuously encapsulated lead frames (reel to reel). For this purpose, all technical plastics are processed at PKT, such as PC, PET, POM, PPS, TPU and LCP.

At tolerances of 0.01 millimetres, quality assurance plays a critical role. The DIN ISO TS 16949 certification, as well as the DIN ISO 9001 quality management system certification which was refined to meet the added requirements of the automotive industry, guarantee superior quality and absolute maintenance of deadlines at PKT. Low downtimes and consistent process quality of the altogether 60 injection moulding machines with clamping forces ranging from 150 to 1000 kN are the core criteria for success for a producer of micro-injection parts.

Since 1970, ARBURG and its ALLROUNDERS have been a reliable partner for PKT. Managing Director Rainer Gille likes to stress the high technical expertise, excellent service and high value for the money offered by ARBURG.

Here, 30 ALLROUNDERS produce micro precision parts such as cogwheels and rotors in an almost fully-automatic three-shift system. In light of this, Gille finds it crucial that ARBURG offers "consistent process quality through precision, reproducibility, dependability and uncomplicated maintenance".

At a company which relies on technical expertise to maintain its competitive edge, it is no surprise to see the latest generation of machines and control technologies. As the smallest member of the new ALLROUNDER U series, the 170 U is outstandingly equipped for micro-injection moulding. And the modern SELOGICA direct control alternative impresses yet again with its 15-inch flat touchscreen display.

At PKT, convenience is not only a feature of its machine controls. The company also offers its employees convenient flexible working hours to help them best adapt their work life to their personal schedules. Grand style for a micro part producer.

The production of precision micro parts entails extremely high demands for the production process and quality assurance.

INFOBOX

Founded: 1969

Employees: 80

Products: Precision micro parts

Machine fleet: A total of 60 injection moulding machines, 30 of which are ALLROUNDERS

Customers: Worldwide customers from the precision engineering, IT, electronics, automotive and medical technology industries

Contact: PKT Präzisions-Kunststoffteile GmbH, Daimlerstraße 5-7, 75233 Tiefenbronn, Germany
www.pkt-gmbh.de



Well protected,

The world leader in protective work goggles, UVEX ARBEITSSCHUTZ GMBH, is seen as a plastics specialist in the safety industry. In keeping with this reputation, uvex has also offered safety shoes with plastic toe caps in its product range since 2001. The latest development from this area is the "uvex xenova" plastic toe caps with a soft TPU edge. This two-component product is produced on an ARBURG production cell which consists of two ALLROUNDERS, two MULTILIFT robotic systems as well as additional peripheral equipment.

Uvex has included safety shoes in its product range since 1980, with plastic toe caps since 2001. Right now, these can be found in 35 percent of uvex safety shoes, a figure which is increasing. The objective is to leave the "iron age" of toe caps once and for all in the near future.

The success of the "uvex xenova" plastic toe caps is due to the key advantages they offer over steel and aluminium types. In addition to their superior thermal and electrical insulation, the xenova safety shoes are also lighter, more comfortable and safer. With their characteristics, they

even greatly exceed the standards set by legal regulations. The reason for this is the special high-tech plastic which was specially developed for the toe caps by uvex in conjunction with the materials specialists at General Electrics Plastics.

From considerations on how to further improve wearing comfort, the idea was born to produce the toe caps as a hard-soft combination from the proven hard high-tech plastic and a soft TPU.

And for this area, the right partner was again sought. The decision was made to go with ARBURG, whose ALLROUNDERS were already in use in uvex production operations.

"Innovative products can often only be made possible using innovative production processes. We were able to subject these to user-specific testing and optimisation at the ARBURG technical centre in Lossburg and also in Rednitzhembach" says Franz Köhl, head of the plastic injection plant, mentioning one of the benefits of working with ARBURG. "Furthermore, we appreciate the user-friendly SELOGICA control system which, for instance, allows for the integration of all peripheral devices."

Following the kick-off meeting for the system in September 2004, the ARBURG projects department created three sepa-



rate concepts: a two-component machine, two ALLROUNDERS linked by a robotic system or two independently-working ALLROUNDERS, each with one MULTILIFT robotic system, which are joined to one another solely via a work-piece circulation system.

Although it is the most complex, the third variation was chosen, as it offers crucial benefits in terms of flexibility: due to its independent production and its transport to the second machine, the pre-moulded part cools off to room temperature and this guarantees a stable process at the second machine at all times. In this way, for example, moulded parts can also be pre-produced and then



uvex

thanks to plastic



later finished by encapsulation.

Time can be saved while switching over to other product versions as well. In this case, production on the first ALLROUNDER can already begin while the second is being converted. The first machine is an ALLROUNDER 420 C 1000-350 with 1000 kN clamping force and a 350 injection unit. A horizontally-operating MULTILIFT H removes both moulded parts from the two cavity mould and sets them down onto work-piece carriers. The sprue is removed by pneumatic cutters.

The specially-designed carriers can be used for all sizes of toe caps while still able to fix four pre-moulded parts into place. Through the recesses on the bottom of the

work-piece carrier, the moulded parts can be cooled from below using air, in the circulation system. To achieve a suitably long cooling time, the work-piece carriers are accumulated ahead of the second machine, an ALLROUNDER 420 C 800-150 with 800 kN of clamping force and an 150 injection unit.

The mould in the second machine features a highly complex contour nest, which demands correspondingly precise insertion of the pre-moulded parts. For this purpose, the vertically-operating MULTILIFT V is equipped with a complex gripper. To simplify automation and avoid transfer, the pre-moulded parts are inserted on the ejector side into the mould and the finished products removed on the nozzle side. In the last step, the two-component toe caps are set down into cartons separated according to cavity.

The work-piece carrier circulation system (centre left) connects the two ALLROUNDERS.

The pre-moulded parts are air-cooled from below during transport (centre right).

The complex gripper inserts the pre-moulded part precisely and removes the finished toe caps (above).

INFOBOX

The company: UVEX ARBEITSSCHUTZ GMBH is a subsidiary of UVEX WINTER HOLDING GmbH & Co. KG

Products: Personal safety equipment: eye, head, hearing and hand protection, safety shoes and work clothing

Machine fleet: 29 injection moulding machines from 700 to 1300 kN clamping force, of which 8 are ALLROUNDERS

Contact: UVEX ARBEITSSCHUTZ GMBH, Würzburger Straße 181-189, 90766 Fürth, Germany, www.uvex.de



The Rainmakers

Whether it's irrigation for large green areas, such as golf courses, or just for the home garden, Hunter Industries in the United States has just the right solution in its product range. This specialist for irrigation systems is known for its innovative products for whose production the company had built its own injection moulding machines up to 2003. Hunter now makes use of specially configured ALLROUNDERS and is thus able to save time and money.

Since Edwin J. Hunter founded the company 25 years ago, Hunter Industries has grown from its humble beginnings at a rapid pace. Today the San Marcos, California based company is one of the world's leading producers of irrigation systems under the management of Richard E. Hunter, the son of the company founder.

In keeping with the company's slogan "The Irrigator Innovators", to date Hunter

has developed over 100 products and holds 250 product patents as well as 42 registered trademarks. From the beginning, the focal point for all of their innovations has always been the irrigation system requirements of the customer.

In 1983, the original PGP rotary sprinkler revolutionised the irrigation industry. The acronym stands for "Professional Gear-driven Pop-up" and describes the operation of this rotary sprinkler, which is still being produced today. The sprinkler is concealed in the ground and pops up when in operation, rotating up to 360° to evenly sprinkle the surrounding area.

In addition to rotary sprinklers in various ver-

sions, the Hunter product range also includes spray sprinklers, nozzles, valves, controllers, central controls and sensors.

These are produced at the main plant in San Marcos, California as well as at production locations in North Carolina and Mexico. The machine fleet comprises a total of 236 injection moulding machines ranging from 230 to 3600 kN (25 to 398 US tonnes) of clamping force. The majority of these machines, around 80 percent, fall within the 500 kN (55 US tonnes) clamping force range.

In addition to its product development and manufacturing activities, for some time now Hunter has also produced its injection moulding machines in-house to meet its specific needs. However, main-





Photos: Hunter

taining these machines was a time-consuming task and machine downtimes were correspondingly long. For this reason, the decision was made in 2003 to begin buying in from proven injection moulding machine manufacturers in order to profit from their expertise and to make use of modern technologies. After taking a thorough look at the market and conducting in-depth practical tests, Hunter decided to include ARBURG among its machine suppliers.

The first ALLROUNDER was purchased in January 2004, followed by an additional 22 machines for production facilities in San Marcos, California and Tijuana, Mexico. In addition to the ALLROUNDER 320 C and 420 C machines from the standard range, Hunter also commissioned ARBURG to build four special machines according to its unique specifications.

"This machine configuration is unique in the injection moulding industry. We use a few machines like this in our production operations which we built ourselves 13 years ago", says Marco Guer-

Hunter®

The Irrigation Innovators

rero, Moulding Production Manager at Hunter.

The equivalent machines from ARBURG are based on the ALLROUNDER 320 C and feature an internal distance of over 320 millimetres (12.6 inches) between tie bars and 500 kN (55 US tonnes) of clamping force. The vertical size 800 (15.3 oz) injection unit, which features a traversing carriage and which injects into the parting line, is special because it is typically used only with the larger ALLROUNDERS. Additionally, the special machines feature a clamping stroke which has been extended by 500 mm (19.69 inches) to 850 mm (33.47 inches), and therefore are equipped with a special safety guard. Because of the unscrewing gear on the fixed mounting platen, it features various openings.

The four special ALLROUNDER 320 C machines are used at the main plant for the production of PGH 12" and PGJ 12" type rotary sprinklers.

"With the ARBURG machines, the overall cycle times of the applications are reduced by 10 seconds, which corresponds to a reduction of about 28 percent. What's more, it becomes possible to reduce machine downtimes by 20 percent" says Marco Guerrero, summing up the advantages of the ALLROUNDERS.



For producing rotary sprinklers (I)
Hunter users specially-configured
ALLROUNDERS (above).

INFOBOX

Founded: 1981

Locations: Production locations in San Marcos, California, Cary, North Carolina and Tijuana, Mexico as well as sales offices in the US, Canada, Australia, England, France, Spain, Jordan and China

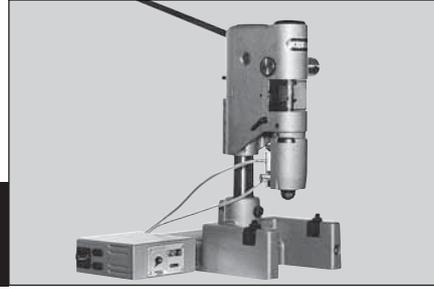
Employees: over 1,000 worldwide

Products: Rotary sprinklers, spray sprinklers and nozzles, valves, controllers, central controls, sensors

Machine fleet: 236 injection moulding machines ranging from 230 to 3600 kN (25 to 398 US tonnes), of which 23 are ALLROUNDERS

Contact: Hunter Industries Incorporated, 1940 Diamond Street, San Marcos, CA 92078, USA, www.hunterindustries.com

MILESTONES



Just about every insider in the industry knows the story about the development of the first ARBURG injection moulding machine. The story is one of photo flashes, which the company produced at the time, of leakage currents which occurred in damp overseas climates and of metal plugs which had to be encapsulated with plastic so that they would work, thus allowing the photo flashes to function. One thing that not everyone knows, is that even the first "ARBURG" was technologically perfect in its conception and construction. Otherwise it would have never generated such a response.

Although first we have to point out that the first "ARBURG" was not identical to the model from 1956 which was series produced and put on sale.



On the machine which Karl Hehl designed and built by hand in 1954, the mould halves were manually inserted and held using cam clamping mechanisms. Metering was necessarily carried out via cams and the temperature was adjustable via a control.

Yet, with this machine, a groundbreaking idea was already being put into practice: in order to encapsulate the parts, the hand-operated plunger injection unit was positioned vertically and operated into the mould parting line, allowing the plugs, with the feed lines already preassembled, to be inserted horizontally with ease and then encapsulated.

However, the first ARBURG series model sold worldwide starting in 1956

also worked via vertical injection into the mould parting line. Right from the start of the ARBURG machine-building era, nothing was left to chance. A mock-up made of wood determined the outer shape of the "classic" machine with the "C" model designation, of which a total of over 10,000 were sold. The final shape of the injection moulding machine model, measuring 50 centimetres high, 30 centimetres deep and 15 centimetres wide, was developed over several stages of finishing. The long lever arm and vertical construction made the ARBURG injection moulding machine instantly unique as well as highly practical.

In 1956 the mechanical engineering department at ARBURG was established. Including foreman and engineers, the staff at the time numbered exactly ten. In the same year, the first series-produced C1 machine, a hand-operated piston machine for shot weights of approximately ten grams, was delivered. Patent applications on the swivelling feature of the clamping unit and the parting line injection were filed at the time, revealing the early farsightedness of the ARBURG founding generation.

This was a farsightedness which paid for itself throughout 50 years of ARBURG injection moulding technology. Today, this international company has a staff of almost 2,000 employees and is a market leader in the industry with its groundbreaking inventions.

Continuous innovative technology development: above is the first hand-operated ARBURG series machine, and 50 years later the universal ARBURG ALLROUNDER U machine series.



TECH TALK

Oliver Schäfer, Technische Information

Processing thermosets reliably

With the injection moulding of thermosets, their varying viscosity characteristics dependent on temperature and reaction time are crucial.

Like thermosets, thermoplasts are plasticised by means of heat application and friction. With the application of heat, however, there also comes a chemical cross-linking reaction, which works against plastification. High temperatures and long dwell times in the plasticising cylinder increase the risk of cross-linking, which means that the moulding material cures. This impairs the flow properties of the moulding material. Additionally, particles which are already cross-linked can be injected into the moulded part as well, which can create weak spots there.

In order to prevent the premature cross-linking of the moulding material in the plasticising cylinder, thermosets are plasticised at relatively low temperatures. The plasticising cylinder is temperature-controlled using liquid. To prevent excessive heat by friction, compression-free screws without non-return valves are mostly used. The L/D ratio of thermoset screws ranges from 12:1 to 15:1, and therefore up to 40 percent below that of thermoplast screws.

In addition to the level of the temperature, the duration of the thermal strain must also be observed. The longer the thermosets are exposed to the application of heat, the more cross-linkage they will exhibit.

Short, open nozzles as well as the low L/D ratio of the screw guarantee a short

dwell time for the moulded material in the plasticising cylinder.

In addition, material cushion are not used during the injection of thermosets. Here, the screw is advanced into the drive cylinder up to the mechanical stop. Depending on the size of the injection unit, the drive cylinder is to be adjusted in such a way that a space of at least 0.5 to 1 millimetre remains between the nozzle and the tip of the screw. The screw must not impact the nozzle during injection.

When a plasticising cylinder is installed for the first time, or when replacing the screw or nozzle, the position of the screw in the front most position must be inspected and adjusted as outlined in the operating manual.

The 100th ALLROUNDER for BTicino

In September 2005, a high-ranking delegation from Italian customer BTicino travelled to Lossburg to celebrate the delivery of their 100th ALLROUNDER together with the ARBURG management team.

An internationally-operating company headquartered in Varese, BTicino owns numerous plants and production facilities worldwide as well as a well-established brand name in over 60 countries.

BTicino products can be found in the areas of home technology, communications and energy distribution and are distinguished by their superior quality standards paired with Italian design. For its injection moulding technology, the

company has relied on ARBURG technology for 20 years and currently has 103 ALLROUNDER machines in use. The clamping forces of these one and two-component machines range from 150 kN to 2500 kN.

In 2005 alone, the company invested in five new ALLROUNDERS, thereby breaking the 100 machine mark.



A high-ranking delegation from BTicino celebrates the handover of the 100th ALLROUNDER with ARBURG management.



The first hand-operated series produced machine

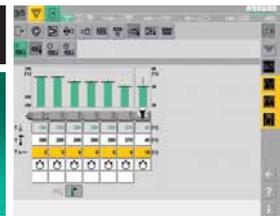


SELOGICA "direct" featuring touchscreen display



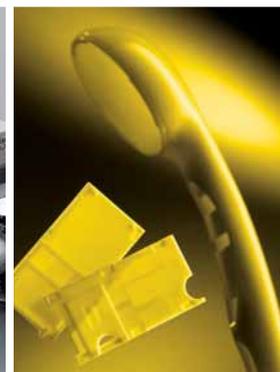
50 years of ARBURG injection moulding machines

Five special GOLDEN EDITIONs



Highly wear-resistant cylinder modules

Allround



50 years – more product!

50 years of ARBURG injection moulding machines: in 2006, we celebrate our golden technology anniversary. Over the past 50 years, ARBURG's practise-oriented injection moulding technology has always been centred on the benefit to the customer. The first injection moulding problem is one which we solved for ourselves and the result of this has been fifty years of ARBURG injection moulding technology. That's reason enough for us to celebrate with the people who made it all possible - with you, the customers. That's why the ALLROUNDER C GOLDEN EDITION has been created, with clamping dimensions between 270 and 570 millimetres, new injection unit sizes and a standard SELOGICA "direct" control system featuring touch-screen operation at a very attractive price. Join in the celebrations! 50 years of ARBURG injection moulding machines equals 50 years of injection moulding experience and trouble-free production, day in, day out!



ARBURG GmbH + Co KG
Postfach 11 09 · 72286 Lossburg
Tel.: +49 (0) 74 46 33-0
Fax: +49 (0) 74 46 33 33 65
e-mail: contact@arburg.com

