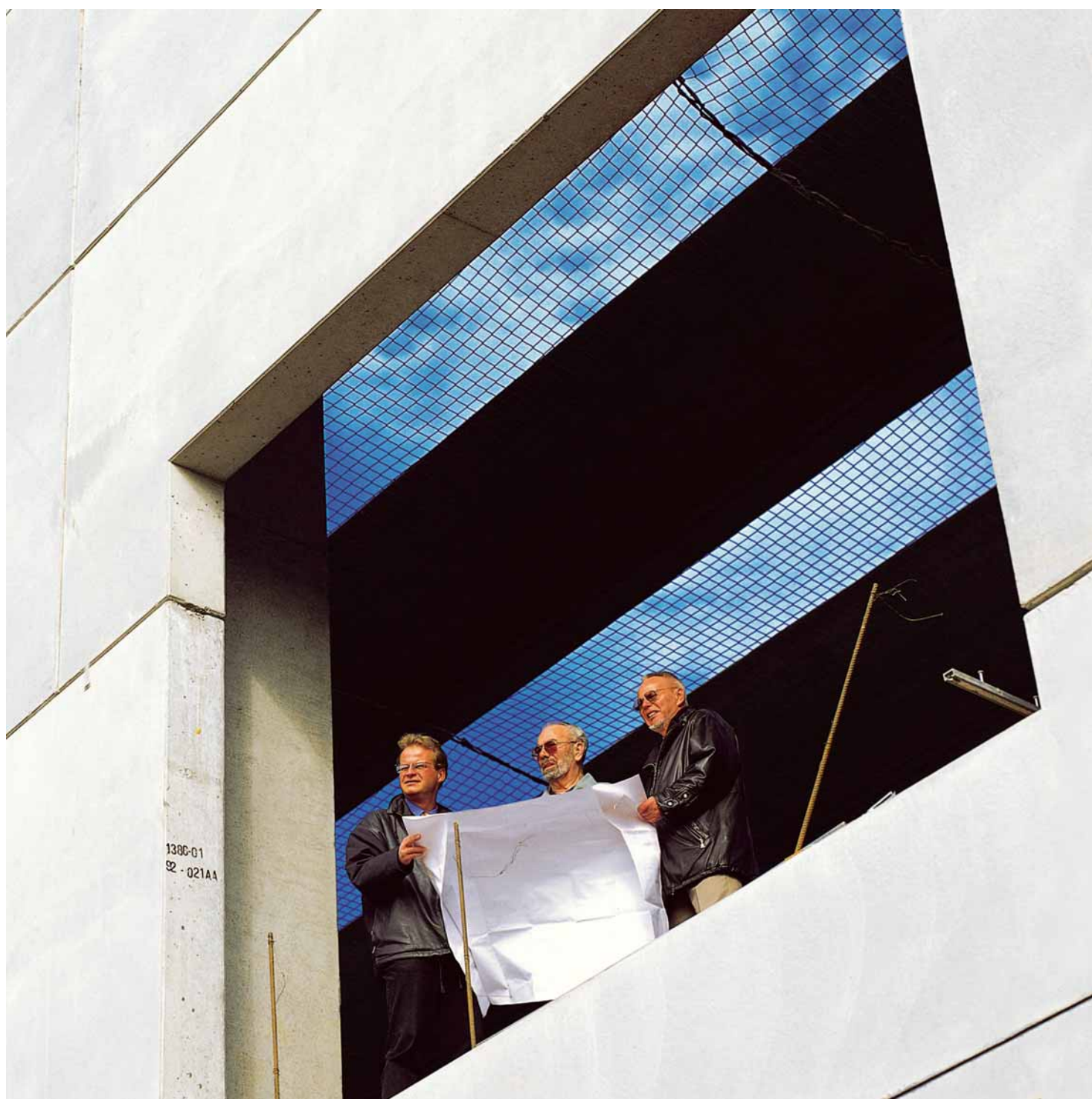


ARBURG II: Architecture for the future



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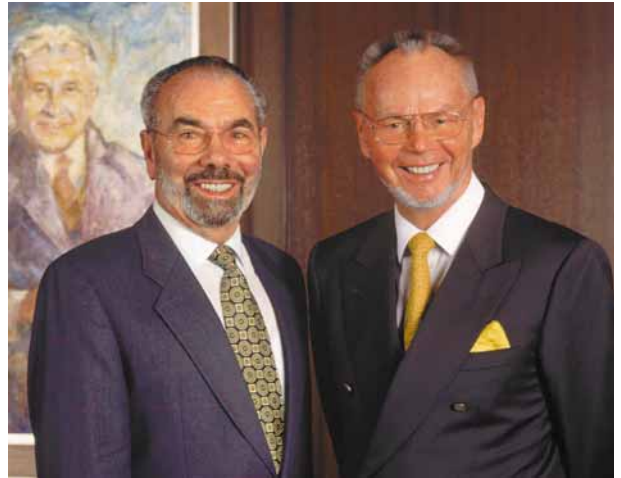
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Opening events generally have a special appeal of their own. But when even a member of the royal family pays a visit to our British subsidiary, that's something truly exceptional – and not just for the employees in Great Britain!

It's a well-known fact that technology has always been in the focal point of our efforts. As a result, we have written some technological history. And so it was only too natural that we named our annual in-house exhibition "ARBURG Technology Days" this year.

Three days of pure technology – during which the SELOGICA control system was the central attraction. 1,500 visitors were on hand to gather in-depth information.

With more than 30 machines and applications, a broad palette of lectures, a display of spare parts, and – by no means least important – the popular plant tours, we took every effort to provide an informative and balanced program. After all, a visit to our Technology Days should also be rewarding for our guests.

It goes without saying, of course, that glances were cast from time to time at ARBURG II. ARBURG II is coming into creation at the spot where steel-reinforced concrete is reaching to the skies. We are making an investment in the traditional headquarters site in the rather keen manner for which we have become known.

We hope that reading this new issue of our ARBURG today will be both entertaining and informative.

Karl Hehl

Eugen Hehl



Diary of a royal ceremony

11:03 AM: Two burly security men with little buttons in their ears and a microphone on their arm take up their positions at the entrance of the new ARBURG subsidiary in Warwick with watchful eyes. And that was the way it started: Princess Anne can enter...

At about noon, two bomb-snooping dogs and their trainers move in and make their rounds here and there through the ultra-modern new building. Of course, everything must be as secure as it can possibly be when the daughter of the English Queen is on hand to open the new ARBURG Headquarters in Warwick.

After the guests of honour have lunched, it's time: at about 1:45 PM, the inconspicuously watchful gentlemen in the recep-



Eugen Hehl, Frank Davis, Princess Anne

tion area receive their anticipated signal by radio from the security escort of the royal visit. Princess Anne is nearing her destination – and the royal banner of the House of Windsor can now be raised on the subsidiary flagpole.

The official guests, including the mayor and her administrative officials, take up their positions in the foyer. Chairmen Eugen and Michael Hehl, Managing Director Heinrich Fritz and subsidiary Manager Frank Davis also prepare themselves for the reception of the Princess.

The first curious bystanders have gathered on the through road, and the police motorcycle escort makes its way up to the front of the headquarters with its nearly 2,000 square metres. Following them – between two Landrovers with security personnel – is the Rover of the Royal House. The Lord Lieutenant, a former army officer in a magnificent uniform, introduces Princess Anne, who is accompanied by a lady-in waiting and a personal bodyguard, to the ARBURG representatives.

Then, there is a ten-minute private conference in the office of Frank Davis, during which time Eugen Hehl provides the uncomplicated member of the Royal House with a survey of ARBURG's

history and development. A tour through the building follows that, and then there is the official opening.



"For the first time, we will be represented with our own building, as is befitting for ARBURG in Great Britain," Eugen Hehl emphasises the historical significance of this day for the British subsidiary.

And then Princess Anne steps forward for the unveiling of a mural that is to be a reminder of this



historic day. With a friendly smile, she poses for the photographer, after which her lady-in waiting reminds her inconspicuously that it is time to leave ARBURG Ltd. once again.

At precisely 3:00 PM – not one second too early or too late – Princess Anne enters her car following her closing gracious words and sweeps away with the column. The royal banner is lowered – and an exciting day in the life of ARBURG's British subsidiary draws to a close.



ARBURG Great Britain

Where steel-reinforced concrete reaches to the skies

"We have to get it done – no matter how!" With these words, Eugen Hehl – with his brother Karl the Management Chairmen at ARBURG – described the time bottleneck into which construction work on ARBURG II had entered during the unusually long and hard Black Forest winter.

The fact of the matter is, there have been 60 days of severe weather since the commencement of construction work last August – many, many more than one could ever have planned for a project of this magnitude. "Since the groundbreaking, it has either rained or snowed practically every day," is the way supervising construction head Manfred Wolfer summarises the weather in Lossburg in recent months – stormy weather in the truest sense of the term.

Despite the time pinch, no one is letting things get out of hand. Construction here is intended for the long term, and therefore every step must have both rhyme and reason. After all, both architecture and functionality must comply with ARBURG standards – two principles that may seem contradictory at first glance, but that must nevertheless be reconciled.

The structural dimensions that must be mastered are – a well-known fact – colossal. More than 300,000 cubic metres of excavation, a total of three new structures on a surface that would encompass nearly four football fields, and roughly 20,000 cubic metres of poured concrete are a few of the impressive key figures.

However, the chronological dimensions are – as always at ARBURG – extremely demanding. In order for the continued expansion to go forward on schedule, construction phase BA 12 must be completed by the company

holidays in August. The explanation is simple: for reasons related to manufacturing technology, ARBURG's entire powder coating operations must be moved into the new building by then.

Now, everyone is attempting to make up for as many of the lost days as possible at an increased tempo. Planning for the move has therefore already reached an advanced stage, and every possible synergetic effect is being exploited. For example, excavation was pushed forward despite the snowstorms, which occasioned the rather amazed comment of the town's regional newspaper – the "Schwarzwälder Bote" – during the deep snows of winter that "the construction site for the new ARBURG plant in Lossburg appears to be the only place in the region at this time where bulldozers are busily digging away."

The structural method that the construction managers have selected for the new production sites is extremely demanding. Impressive steel-reinforced concrete structures that are planned have already been realised to some extent. Mighty concrete pillars reach up to the skies – impressive structural supports with gigantic spanning dimensions that will accommodate the

roofing surfaces. Work is progressing here with "shed roofs" or "saw-tooth roofs," as they are called. These roof structures, which are for the most part transparent, are calculated in an elaborate process in such a manner that as much daylight as possible will pervade the area – without heating the building areas located below them too much because of strong sunlight.

The procedure with the new buildings as work progresses is always the same. The red earth of the Lossburg variegated sandstone plate must first be excavated before work can begin on the foundation, followed by the power supply channels and the structural sheaths, as they are called. The sheaths will later receive the gigantic steel-reinforced supports. Then, the so-called trough roofs will be installed. As the name implies, the individual elements remind one of troughs that have been turned over, a technology that provides tremendous rigidity and stability.

ARBURG I is closed off by BA 12 with its nearly 5,000 square metres of effective surface. Its side walls were set in place in April. Connected with it, a Logistics building (cold building) – the beginning of ARBURG II and a visual separation – will be erected.

The preliminary work for the flooring has already been undertaken and the sheaths set up for the large new production building (BA 21). This building will have nearly 18,000 square metres of effective surface when finished. In the prudent manner of the corporate family, this construction phase was designed as the so-called "ARBURG Module" and can thus be duplicated in the future without major problems.

And so it has come to pass these days that, more and more frequently, an eye is cast here and there toward the horizon in Lossburg to take a reading on the weather picture. Because the weather is something that not even ARBURG can change ...





The façade is even impressive on the blueprints





CA

ARBURG Technology Days – A smashing success!



Along with the main themes of the SELOGICA control unit and machine technology, original spare parts and mould engineering proved to be focal points of interest for the visitors.



1,500 visitors from 21 countries took advantage of ARBURG's Technology Days at the beginning of May to gain a picture of the new machine technology in the world of injection moulding on-site at Lossburg.

This year, ARBURG placed the focus of its traditional springtime event on the control technology utilised by the ALLROUNDER injection moulding machines. Since the K '98 Exhibition, ARBURG has installed the SELOGICA control unit on all machines. All peripheral devices – material dryers or robotic handling devices, for example – can also be user-programmed and operated via the SELOGICA control unit with its graphics-based sequence editor.

Those responsible for putting on the event were extremely satisfied with the excellent visitor turnout and success of the Technology Days. Many of the guests made journeys from faraway lands to gather information about the latest engineering developments at ARBURG on site. Professionals from all over Europe, South Africa, Argentina, India and Israel made their way to Lossburg.

Together with the traditionally-strong visitor turnout from the countries of Western Europe, the numbers of visitors from Eastern European countries increased significantly.

32 machines with different equipment, different performance ranges and application tasks, numerous product offerings from the area of peripheral devices as well as an attractive and rounded lecture program with the major emphasis on the "SELOGICA control unit" were presented as a broadly-diversified informational program. In a special presentation, visitors received information about the benefits of ARBURG's original spare parts.

Guests from the professional world could add to their knowledge base in the four lectures on the subject of the SELOGICA control unit that were held by in-house and outside speakers in ARBURG's training rooms.

Seen from a purely statistical point of view, every one of the 1,500 guests took advantage of at least one of these opportunities. The proof in the pudding was provided by the interesting questions and topics that originated from the very heart of everyday production.

"SELOGICA control unit" was also the motto for the plant tours that were conducted this year – tours that were heavily frequented as always. ARBURG designs and manufactures all of the hardware and software of its machine control unit completely independently. Of course, part of the tour was information provided at a viewing point concerning the progress of construction for ARBURG II.



Thermoset specialists

As of now, ARBURG has several ALLROUNDERS in its product line that are specially tuned for processing thermosets.

With the appropriate equipment, these machines can process both pourable materials as well as moist polyester compounds. From an engineering standpoint, all machines are based on the ALLROUNDER C series.

The specialists for processing thermosets:

ALLROUNDER 320 C 500-100
ALLROUNDER 320 C 500-250
ALLROUNDER 420 C 1000-250
ALLROUNDER 420 C 1000-350
ALLROUNDER 420 C 1300-350
ALLROUNDER 420 C 1300-675
ALLROUNDER 520 C 2000-675
ALLROUNDER 570 C 2200-675
ALLROUNDER 570 C 2200-1300

For pourable thermoset materials, the five different injection units are supplied with screw diameters of 20 and 25 mm (unit size: 100), 30 and 35 mm (250), 35, 40 and 45 mm (350), 45, 50 and 55 mm (675), as well as 55 and 60 mm (1300). The plasticising cylinders have fluid temperature controls and work with a de-compression screw without a check valve.

Detailed attention to processing properties

Temperature and time must be managed precisely in order to bring about the optimal cross-linking of the thermoset material. For just this reason, special demands are placed on the cylinder assemblies. The heat of friction must be dissipated so that cross-linking does not begin in the cylinder. ARBURG has installed special temperature-control sleeves on the cylinders that ensure appropriate high levels of heat dissipation.

Because of the use of open and very short nozzles, only extremely small amounts of material that is subjected to the hazard of premature curing can accumulate there at the end of the holding pressure phase.

Among other standard features, the machines possess a servo-regulated hydraulic system, extended movements and production controls. The ALLROUNDERS have capabilities for injection compression venting as well as air blasting.

Up to six temperature-control units can be operated directly via a special interface. Two units are included in the standard equipment package. Auxiliary heating circuits that can be programmed and regulated via the SELOGICA – six are included as basic standard equipment – can be installed as options for heating the mould. The SELOGICA control unit also has special input capabilities for curing times and dosage delay.



Among the additional options that are recommended are the provision for advance movement to an intermediate stop with closed mould for pressure separation of the sprues with the hydraulic ejector, an interface for brush removal devices or an actuation unit for the vacuum pump. With the equipment package for thermoset processing, ARBURG provides a special machine with all necessary technology at a fixed price. This is attractive ALLROUNDER engineering that can be expanded for the processing of moist polyester. Both materials lend themselves to processing on ALLROUNDER T rotary table machines with the existing technical equipment.

Moist polyester is subject to different laws

The processing of polyester is offered exclusively in conjunction with the largest screw diameters of the respective units. These are 30, 40, 50, 60, and 70 mm, combined with the specific size of the injection unit.

Additional essential equipment that is available especially for the processing of polyester includes an adapted cylinder with a nozzle dipping dimension of 100 mm and a screw with a check valve, a special nozzle with a dipping dimension of 175 mm, the INJESTER stuffing unit with a changer for 25-litre containers, additional temperature-control devices, as well as connection accessories for operation with water.

Successful audit: ARBURG is 2000-compliant

A Y2K audit was performed at ARBURG on March 1st by the Technical Supervisory Association of Rheinland/Berlin-Brandenburg. And so the year 2000 – and with it the great computer crash – has lost its spectral presence for ARBURG. All of its computer systems are Y2K-compliant.

It was necessary to check virtually every computer at ARBURG for its functioning after the



“magic date” and to make adjustments where necessary. If one thinks of the high degree of integration of information systems with the data processing network in the company, this is indeed a daunting challenge. It is especially important to remember that no part – no matter how insignificant – of the whole can be forgotten, because it’s the little acorns that grow into giant oaks, as the proverb states.

For just this reason, ARBURG had already begun taking necessary conversion actions by the end of 1996. These actions are now for the most part advanced toward completion. The security of the essential Corporate processes is no longer in jeopardy. Any remaining activities that are still necessary have been scheduled and no longer pose a hurdle for the success of the conversion.

And so ARBURG can even now guarantee to its customers that it is Y2K-compliant without reservations – thereby guaranteeing its customary reliability, on-time deliveries as well as product and service quality. Along with certification in compliance with ISO 9001 and 14000, this third “clean bill of health” pertaining to the new millennium is no less important.

Customers seeking consultation, support and service may contact their Sales Engineer or area Sales Manager for initial assistance.

If necessary, appropriate contacts in the company’s Thermoset Group will then be established. In this department, there are specialists who can answer questions pertaining to both applications technology and processing technology and who will support the customer from planning to production of parts.



Optimal lighting

Injection moulders with technical expertise know where Krauchenwies-Göggingen is located. It is with this name that the VEMA company is associated – a company that produces engineered plastic parts with its own tooling and moulds, primarily for the automobile industry.

The catchwords in this connection are "PMMA-TPE compounds" for automotive lenses with a reflector area and light-transparent sectors.

Drive to Tuttlingen – It's straight ahead from there

Founded in 1982 by its two Managing Directors Werner Vesper and Josef Macho, the company concentrated from the start on the manufacturing of high-quality engineered parts. Today, there are 40 employees in production and administration.

The link between ARBURG and VEMA is what people commonly refer to as a "long-term co-operative effort." Right up to today, the company has relied exclusively on machine engineering from Lossburg.

Production consists of 18 ALLROUNDERS with clamping forces between 250 and 2200 kN. Four machines between 800 and 2200 kN are designed for two-component injection moulding. Parts with two colours or two components can be manufactured with shot weights up to 500 g/PS.

VEMA's distinguishing features

VEMA is well-known in the plastics industry as a supplier of high-quality engineered injection moulded parts. Insertion parts, assembly modules, optical and visual parts are also manufactured. Design parts such as actuation keys and panels round out the manufacturing spectrum.

In order to provide support for its customers that extends from planning to the realisation of new injection moulded parts, VEMA has set up its own facilities for mould, fixture and model construction. In this way, VEMA can supply complete solutions that are created together with the customer. VEMA is certified in compliance with ISO 9002, and audited by Robert Bosch and Geberit GmbH.

Mould construction: The beginning of the injection moulded part

"Without rapid mould construction that functions based on cutting-edge technologies, it is impossible to obtain truly profitable orders any more." This is how Josef Macho, one of the two Managing Directors, summarises the current situation for manufacturers of engineered injection moulded parts.

The result of this philosophy is tool and mould construction with state-of-the-art machines that produce the complete injection mould based on specifications from the company's Engineering Department. All data – including the milling programs – are generated centrally with cutting edge 3D-CAD/CAM software. The Measurement and Testing Department is integrated into the work of mould construction.

At the same time, VEMA is included in the engineering design of the complete components from the very outset. As time has passed, the proportion of these complete-specification projects has reached 70%.



Special expertise – Lenses for passenger cars

This particular moulded part is a highly-complex product that is difficult to manufacture. The part specifications were defined by BMW and are forwarded to VEMA via Bosch as the supplier of the complete directional signal unit.

Different task definitions

First of all, the lens is manufactured from PMMA and the seal area from TPE in one work operation as a two-component part.

Then there is a defined sector in the side reflector area of the orange-coloured lens that is light-permeable. In order to achieve this final outcome, the prism structure must be varied.



Elaborate mould engineering and first-class injection moulding technology: VEMA lights up the darkness

The basis of the "domed cat's eyes"

The electroplated mould insert displays a special reflecting geometry. The prisms must reflect the light ray as it strikes in such a manner that it arrives back with the same intensity. The light-transparent area that allows the turn-signal light to shine through



in a defined relationship to the outside is achieved from a mould-engineering standpoint by capping off the prism tips.

PMMA and TPE – are they compatible?

The fact of the matter is, that these two materials can only be bonded to provide a high-quality result by maintaining a precise temperature distribution in the mould. A component must be added to the TPE so that bonding with the PMMA can be generated. In addition, the PMMA must be cooled down to a temperature that ensures the optimal bond with the TPE. If the tolerance range of ± 2 °C is exceeded or underrun, the parts will indeed still be mechanically sound, but the required specifications for the reflective characteristics will no longer be attained because of minimal alterations in the curvature of the lens.

The parts are injected on two 520 V 2000 ALLROUNDERS, whereby the horizontal unit with size 675 was combined with a vertical 350 unit. Both machines are equipped with the SELOGICA control unit, which also manages the core pulls, additional temperature-control circuits as well as the removal devices. For Josef Macho, the fact that the control system allows great flexibility in a broad range of work sequences provides a special benefit.

The complete cycle for the production of the two lenses is approx. 68 seconds. This allows a daily production rate of between 1,800 and 2,000 parts sets.

Multiple monitoring – Quality as premise number 1

Quality monitoring is handled right at the ALLROUNDER with a visual inspection by machine personnel. In addition, one to two random samples per 100 shots are taken for a pull-off test-to-breakpoint to check the quality of the bond.

JIT manufacturing

VEMA delivers the lenses for Bosch by job-order to type specification. In actual practice, this means that not all 3-series and 7-series lenses are produced in continual runs. Instead, the moulds can be exchanged for specific jobs. It is not necessary to change the entire mould, but rather only the cores. The result is that production conversions are made within the shortest possible time.



Better, faster – and more satisfied

ARBURG can point to excellent results in a market where speed, reliability and quality count above all else.

The topic here is the Optical Disc (OD) market, for which ARBURG has two special packages to offer: the ALLDISC and the TWINDISC. With the ALLDISC – an injection moulding machine tuned to meet the special needs of the OD manufacturer for fast cycle times – ARBURG takes a leading position among machine manufacturers, just as it does with the TWINDISC for producing two CDs in one injection cycle.

ALLDISC: The Sonopress Company

At Sonopress in Gütersloh, Germany, one of these speedy ALLDISC 270 S machines has been in operation for several weeks now. The clamping force was increased to 500 kN by means of a new mould clamping unit. Since the producer of audio CDs and CD-ROMs has set his specifications for quality even higher than the standards defined in the Sony and Philips "Red Book," it is called, the initial test phase was a corresponding challenge for the ALLDISC.

Cycle time: 3.5 seconds

Sonopress is extremely satisfied with the machine following these start-up tests. Despite the high demands, the ALLDISC attains cycle times of 3.5 seconds in the production of audio CDs and CD-ROMs.

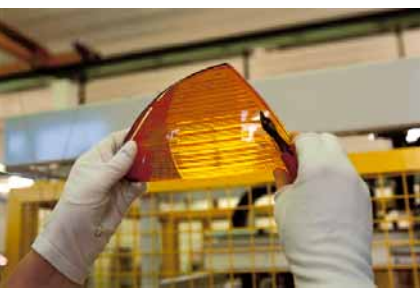
TWINDISC: The OMD Company

At OMD in Switzerland – another well-known producer of ODs – there are already five TWINDISC 320 C machines at work. Working together with system integrator Robi, ARBURG planned the machines and has optimised them for the production requirements of OMD. Since the beginning of 1999, a Beta test has been running at OMD with an ARBURG TWINDISC 270 S, testing that is designed to lead to the final purchase release for this machine.

Benefits of the TWINDISC

Hans Kruesi, the Managing Director of OMD Productions AG, sums up the benefits of twin cavity moulding for OD production as follows: "The production of two CDs in one work operation provides effective benefits in time and costs. However, these benefits can only be exploited in conjunction with machine engineering that is matched optimally to production conditions."

According to Hans Kruesi, the ALLROUNDERS, with their cost-effective and robust engineering – and above all the SELOGICA control unit with its individualised programming and access options – as well as the comprehensive quality assurance functions, provide an outstanding basis for the rapid and high-quality production required by OMD.





Nozzle tips



Couplings

ARBURG getting even closer

As a leading manufacturer of injection moulding machines, who wouldn't be happy to hear that customers also rate the world-wide service of the company as excellent from top to bottom.

Fast answers to tricky questions, reliable deliveries, especially for spare parts, comprehensive training packages and all-inclusive support beginning with planning and extending to commissioning – those are all benefits that ARBURG customers can take advantage of if they need a new ALLROUNDER or have problems with one of their existing machines. Of course, you can't rest on these laurels without allowing the competition to come a little closer. And then, it's precisely the Swabians who are known for improving good things with new ideas.

The latest of these ideas is known as "AEM" – which stands for "Aktives Ersatzteil Management" in German, or "Active Spare Part Management." Hidden behind the simple abbreviation, however, are some lofty demands. Just consider the following scenario for a moment: The customer places an order for spare parts for his ALLROUNDER as usual. While talking with ARBURG's Spare Parts Service, he receives relevant information on delivery lead times and pricing for his spare parts. At the same time, the assigned Parts Representative offers the caller custom-tailored service kits at op-

timal prices for future maintenance jobs scheduled on his ARBURG ALLROUNDERS. Additional consultation is provided concerning other replacement parts and accessories that would be beneficial to the customer. In other words: the customer does not have to wait until an actual need arises for the specific components to perform required maintenance jobs on his ALLROUNDER. ARBURG's Spare Parts Service assumes this task for him by actively consulting with him and providing "up-front" support. In addition, the customer receives important information concerning the spare parts and accessories delivery programs from ARBURG.

With this program, ARBURG is attempting to take an even more active role in meeting the customer's needs in the future and to make services even more attractive. The main objective is even better and more active service support.

One concrete measure from these efforts will be individual spare parts kits that are specifically tailored for the individual customer's ALLROUNDERS. By monitoring the spare parts mar-



Screws

ketplace in detail, more flexibility will be gained for the future since it will be possible to respond more specifically both in terms of timeliness and parts volumes. The Service staff will be able to approach customers even more specifically and hence to respond to

their needs more effectively. This improvement in communications is intended to provide valuable information concerning customer purchase habits as well as current market trends. Tendencies in the marketplace can be recognised at an early point so that the Service team can also take appropriate actions on a more timely basis. The clear result: better service through better customer contact.

At ARBURG, the hope is that even greater customer satisfaction resulting from "Active Spare Parts Management" will have a positive effect on the overall company image and customer loyalty. The first building block of the modular AEM system is scheduled to be integrated into the service line by the middle of 1999. Further modules will then be added throughout the year. This ARBURG service – optimised because it is more individualised – is thus equipped in the best possible way to meet the Third Millennium.



Check valves



Electro-mechanical dosage: Production increases with simultaneous energy savings

Electric or hydraulic: which is the best drive for injection moulding machines? The right answer is found in a combination of both drive types – in a hybrid technology, in other words. The most energy-intensive operation in injection moulding is the dosage. If this operation is removed from the hydraulic drive of the machine and performed electrically, the results show up in many benefits for the machine operator that pay off in hard cash.

Increase your productivity.

1 The electrically-driven dosage axle is operated completely independently of the hydraulic system of the injection moulding machine. As a result, the dosage operation can last from as early as the conclusion of the holding pressure phase – simultaneously with other machine movements – to the beginning of the following injection operation. This results in a tremendous increase in productivity because of the reductions in cycle times by seconds for all injection cycles that are determined by the dosage time.

Conserve precious energy resources.

2 Roughly 40-60 % of the total energy outlay in an injection cycle is accrued during the dosage operation. By the use of an electro-mechanical dosage drive instead of a hydraulic drive, energy savings of up to 20 % – related to the entire cycle – can be achieved.

Prepare material with less waste.

3 Because of the simultaneity of the movements, it is possible to work with lower screw rotational speeds. The required material volume can be prepared in an extended plasticising time without a change in the cycle time. A reduction in the shear load on the plastic is possible as a result, while the material throughput remains constant.

Reduce your cycle time.

4 Since there is less material stress during preparation, an improvement in the homogeneity of the mass is possible, whereby a reduction in melt temperature can be achieved. As a result, a reduction in the residual cooling period – and with it the entire cycle – is made possible.

Increase your material throughput.

5 Since the greatest share of the energy required is accrued by the dosage unit, the loads placed on the main motor can be reduced significantly. As a result, higher throughput is possible without the requirement for a design with a larger main motor.

With the utilisation of electro-mechanical dosage, the same performance specifications and torque data apply as with the hydraulic drives.

Electro-mechanical dosage is possible with size 350, 675 and 1300 injection units and is offered as an option on all our machines of the S and C series.

Full concentration on smartcards

With the beginning of 1999, ARBURG has assumed all commercial activities for the SMARTLINER 800.

Since that time, Smartcards Sales Manager Eric de Bruijn – a familiar name in the industry – has been available to customers and prospects as the direct contact for all smartcard-related issues.

Optimal support

ARBURG's highly-developed Sales and Service network guarantees optimal support for the world-wide smartcard market. The SMARTLINER 800 was introduced to the market at the "K '98" in Düsseldorf and the "CarteS 98" in Paris. With its new production capabilities, it also provided excitement at the CTST '99 in Chicago.



At least 800 card blanks can be produced every hour with this compact system – with or without



a chip recess. The simple and fast changeover of mould inserts in this process is just one of the many benefits of the system.

Benefits with SELOGICA

The SELOGICA user interface and the modular mould system allow highly flexible production while providing favourable conditions that were previously unknown.

Injection unit: Size XXL

Large, larger – and then 1300! You could put it that way when you look at the dimensions of the largest injection unit that is currently available at ARBURG.

However, the EUROMAP size 1300 just by itself doesn't say anything about performance. And – with a shot weight of up to 759 g in polystyrol – performance is indeed "Xtra Xtra Large."

Size where it's needed

The new injection unit is installed on the large ALLROUNDER 570 C with a clamping force of 2200 kN. Three different screws with diameters of 55, 60 and 70 mm are available. Special attention was given to the high demands placed by plasticising performance in the design of all three screw dimensions.

For its 1300 unit, ARBURG offers an optional electro-mechanical dosage drive that works independently of the machine's hydraulic system. It can be integrated completely into the injection unit. As a result, the dosage operation can take place simultaneously with other machine movements, which means – along with shortened cycle times – increases in productivity, energy savings of up to 20 %, and material preparation that is much gentler on the material. Since the entire unit can be pivoted laterally, the tasks changing material, nozzles, screws or cylinders is facilitated significantly.

As a series standard, injection is carried out with a closed control circuit. Position regulation or injection process regulation are optional. Heating of the cylinders is handled adaptively and is programmed via the SELOGICA machine controls. Additional cylinder modules for processing thermosets or LSR or for injecting powder materials are available as special equipment options.



Little parts that make great things move

Those who strive for the best connections are always a positive topic for conversation. And if anyone believes that the following narrative is about telecommunications – well, they're wrong. John Guest Ltd. is the name of the company we wish to tell you about.



In West Drayton in England's Middlesex, you will find the headquarters of the world's largest manufacturer of plug-in fittings for pressure lines, John Guest Ltd.

John Guest's excellent connections help to keep things moving. In doing so for more than 30 years, this family business has placed its trust in ALLROUNDER machine technology.

John Guest began his notable business career in the 1960's with the production of tools and injection moulded parts made of metal. The circumstances changed rapidly as Guest began to implement his idea of a plug-in metal coupling as the connection between pressure lines. In the '70's, production was shifted over to a fitting that was made completely of plastic. With the "Super Speedfit" pressure line connector, the first fully proprietary product was introduced onto the international marketplace.

24 million fittings were produced in 1989; by 1994, that number had climbed to 60 million. Today, the product line of John Guest Ltd. includes more than 3,000 different connector types and sizes.

Consumers include primarily the automobile industry, construction installers and machine builders. With the passage of time, more than 500 employees are engaged at two production locations in West Drayton. John

ity criteria in production was not an insignificant element in the agreement.

The accompanying long list of awards began in 1984 with the installation of new connections made of plastic for petrol lines by the Ford Motor Company. In 1985, the plastic fittings won the "Horner's Award" of the British Plastics Federation for the utilisation of plastics that is both innovative and demonstrates significant practical value. The British Design Award followed in 1987. 1988 saw the accomplishment of significant quality standards: inclu-

sion in the list of Ford suppliers based on Q101 and certification on the basis of the British Standard BS 5750, Parts 1 and 2, which corresponds to evaluation based on ISO 9001 and 9002. Volvo, British Telecom, Peugeot, the German beverage industry, the Fiat Group or British Gas – the customer and auditor lists of John Guest Ltd, read like a "Who's who" of the international economy.

Investments to secure the future

Investments are required in order to ensure that the large corporations will still be as unanimous in their evaluation of John Guest's products in 5 or 10 years as they are today. In West Drayton, near London's Heathrow Airport, there are now five production and administration buildings with a surface area of 155,000 square metres. However,

it is not just the production locations and the company's subsidiaries in the USA, France, Germany, Italy, Spain and New Zealand that demand significant expenditures, but also tooling construction and research and development. More than 70 staff members work in the R&D area alone. It is their task to provide for new engineering developments, tooling configuration and design, and the maintenance and repair of injection moulds and castings.

In all this, the word for the day is always the same: Minimum downtime for production and maintenance of all tools. Less than two weeks are spent in peak periods between planning and realisation of injection moulds. Tim Guest, Managing Director for the Tool Construction and Engineering Services Department, boils it down to this: "If you don't have good toolmakers and machines, you can't build good tools. And you have to have good tools in order to manufacture good products!"

Innovative thinking brings about progress

Tomorrow's innovations must be secured by today's successes. And it is for just this reason that John Guest Ltd. is not just a manufacturing organisation, but a "think tank" as well. Thus, for example, more and more ALLROUNDER injection moulding machines have been converted from conventional injection to sprueless injection with hot-runner systems. The introduction of this technology allows production with a reduction of up to 75 % of

Guest's export share was already above 60 % of total production by 1996, and the trend here is, quite naturally, clearly on the rise.

Success: Investment and Quality

The development of John Guest Ltd. can be reduced to this common denominator. However, investment does not mean investing in new production buildings and machines alone, but instead primarily in a professional staff.

The topic of quality takes up a broad area in the production of this corporation. In 1986, the introduction of all-inclusive quality monitoring was initiated at John Guest Ltd. with the system for statistical process controls. This move bore its first fruit one year later as Pepsi Cola consummated a contract for the delivery of fittings for the new vending machines of the soft drink giant. The maintenance of highest qual-



manufacturing costs, a significant lowering of material requirements and the elimination of a second, downstream processing stage before assembly of the components.

The acquisition of ALLROUNDERS with clamping forces of 1000 kN and more also makes the production of larger plastic parts possible in order to better meet the requirements of water utilities and the brewing and hydraulic industries. And

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then there is always the production of completely-assembled components for the home-handyman area. Clearly broad fields for long-term and close co-operation lasting into the future.

Continuity as the basis of success

From the very beginning, John Guest and his employees worked closely and co-operatively with the ARBURG subsidiary in Warwick, Great Britain.

The result: with 82 ARBURG ALLROUNDERS now, John Guest Ltd. ranks among the most important customers on the British Isles.

The company's machine line-up ranges from type 270 H and D machines, to 500 kN type 320 D ALLROUNDERS and 270 M 350-90 and 320 M 500-210 machines, and extends to a 1000 kN type 420 M, whereby the oldest machine is still hard at work around the clock.

The newest machine generation is represented in the plants of John Guest Ltd. in the meantime in the form of 10 type 270 S 350-150 ALLROUNDERS. The machine contingent is rounded out by a type 305-700-210/210 ALLROUNDER for two-colour, two-material injection. This machine is installed in the company's R&D area.

John Guest Ltd. is one of the larger companies world-wide, and it has grown together with ARBURG. And that is a very good example of what a long-term co-operative effort between two active and innovative companies can bring about.

John Guest explains the reason that the decisions were made in favour of the S machine generation very pragmatically. "A decisive factor for the ALLROUNDER S, first of all, is the flexibility it achieves with the SELOGICA control system. Furthermore, the machine's compact footprint requires only a relatively small set-up area – a criterion that is gaining significance in today's production environment. Not least of all, the new colours were a purely emotional factor in the purchasing decision for us!"

The pilot goes on board

Franz Beitzl – for many long years the Head of Customer Training at ARBURG. On April 30, he left the company after almost exactly 35 years and set his course for retirement. Nevertheless, it's probably only his closer acquaint-



ances who know that life is actually just getting started for him – and that he has a very clear picture of how "life after ARBURG" will be for him. The Pilot, you see, is not leaving the ship, but rather is going on board. He's now boarding his own yacht which is already resting at anchor in Northern Italy's Lake Garda.

Franz Beitzl could almost be called part of ARBURG's capital inventory. The man who was born 60 years ago in Greece's Piraeus is one of those people who always want to get things moving. And one of those who could raise his voice and make you uncomfortably aware of his presence now and then when he thought that things at ARBURG weren't going quite right.

Beitzl was employed at ARBURG since 1964. Right from the beginning, his task was to handle the build-up and expansion of that important area of

service in the company called "Training." He was first involved as a seminar leader for several different machine types. Then, when Training was moved from the Applications Technology Department in 1979, he became the Head of ARBURG Customer Training. And speaking of applications technology, because of his activities, he also became a sought-after adviser when it came to tricks, troubleshooting or correcting problems on injection moulding machines.

Joachim Burkhardt is fully aware that it will be a difficult task to fill these shoes. Nevertheless, he is taking on the task with great enthusiasm. His background makes him the perfect successor to Beitzl. In 1989, the trained toolmaker joined forces with ARBURG, and spent 21 months in in-depth training as an applications technician. On the program in 1990 and 1991 was advanced training to reach the level of Master Technician in the industrial area of plastics and elastomers.

Following assignments as Technical Trainer in Applications Technology and Training Supervisor for Trainees in plastics mould manufacturing, he was promoted on May 1 to become the new Head of Customer Training. His sincere wish is to maintain the department at the high informational level of his predecessor and to elaborate and expand the details of the course offerings. In this way, there will be continuity



in customer training at ARBURG, something that will mean benefits for customers into the future.





Busy as can be in the Warehouse Transfer Point

ARBURG's Goods Receiving looks like nothing less than a beehive on some days. With hustle and bustle, goods are delivered, unpacked, consigned for shipment and prepared to customer specifications, recorded for the data processing system, subjected to part number and quality checks – and then?

If things were allowed to just sit about, it wouldn't be long before nothing would be able to move. After all, between 8,500 and 9,000 part numbers land at the company every month – not to mention unanticipated warehouse

receipts such as individually-ordered spare parts.

Internal logistics represents an enormous task when seen from this light – a task that must be coped with practically 'round-the-clock. The objective: all goods must be transported as quickly and precisely as possible from the point of delivery to their ultimate destination. The solution:

The TLS Transport Control System with the first two sub-areas "Stacker Co-ordination" and "Package Service" has been employed at ARBURG since the first half of the year in the entire company. Further modules will follow.

TLS encompasses all means of transport

In the future, the all-inclusive ARBURG Transport Control System will co-ordinate and process all internal company transport activities with centralised controls. All available transport means are integrated into this system. All movements of goods by means of stacker, Power & Free systems, heavy load tube conveyor and decentralised conveyor systems will be controlled by TLS. Together with the stackers, the package



service and the management and dispatching of all trucks on the ARBURG plant grounds have now been incorporated into the control system. The Power & Free conveyor systems are planned to follow later this year.

Helmut Stumpp, who supervises the Transport Control System, describes the objectives that ARBURG associates with the introduction of TLS as follows: "In addition to a reduction in transport costs and cutting transport times, we wanted to reduce the search times at the destinations. Of course, an enhancement of transport reliability also played a significant role."

When this kind of computer-supported logistics system is operated in a company, one also naturally wants a clear view of how the current flow of material is working, as well as an understanding of material flows in the past. The system provides just this clarity. In addition, it is open for future material-flow installations and can also initiate the automated start-up of transport movements. However, "being open" also means that special transport activities can be set in motion by practically every employee.

The entry of the necessary data into one of the PDA (Production Data Acquisition) terminals distributed throughout the company is all that is required to define this kind of transport order. The origin and destination co-ordinates are clearly viewable from posted signs. The transport voucher is printed out by a laser printer at the location and is attached to the shipment. Recurring transport orders can also be defined and stored in the system via the TLS. These orders are then initiated automatically on an ongoing basis.

Finally, the TLS must possess the capability to allocate costs accurately for a transport activity based on the principle of causation in order to make the financial aspects of the internal transport system clear.

The TLS is integrated fully into the other ARBURG data processing areas. This is especially important for communication with the host computer, the warehouse administration computer and the different SPC (Stored-Program Controller) areas.

How does a "transport" occur?

No transport action takes place without an event. Events are, for example, "Conclude work phase" or "Retrieve consigned palette." Once a System Processor has entered the command via PDA, LVS or the host computer, TLS begins its work. Two typical examples will serve to clarify the work sequence. In Manufacturing, a job order that pertains to a manufacturing order is created automatically by the command "Conclude work phase." One or more pallets must be transported from one cost centre to another. In the Warehouse, a transport job that includes the source and destination is created for every consigned palette. Either multiple orders can be compiled on one palette, multiple pallets can be combined for one transport order, or a transport order can be issued for each internal transport means (THM).





How transport actions are executed

Every THM to be transported leads to one or more transport orders, including vouchers, that go to the appropriate means of transport. The entire transport section is distributed into different, non-overlapping zones. As a result, all path co-ordinates for the stackers, for example (and ultimately for the Power & Free conveyors), are allocated to exactly one zone. The starting

zone for the transport is the definitive factor for the allocation of stackers; which stackers can be employed where is also managed via the master data.

All stackers are allocated dynamically to the plant areas, which means that they can be utilised at the network points throughout the plant. The individual floor conveyors receive their next order via radio data communication. A new order is not issued until the first order has been completed and the stacker sends its "free" signal.

The materials "flows"

For the Manufacturing, Warehouse Receiving, Assembly and Consignment areas, there are material flow diagrams at ARBURG that are stored in TLS. These diagrams define the exact transport paths between the individual areas. The transport means that are available between these areas and special requirements that must be fulfilled in order to initiate a transport activity are also listed. Processing of the orders is managed to achieve the optimal path and time. The system recognises alternative routes and, if programmable time specifications are exceeded, it can automatically set transport priorities.

With the installation of the centralised Transport Control System, ARBURG has taken a significant step toward an efficient system for internal logistics management that will bring savings in both costs and time.

TLS centrally manages movements of materials and goods that occur in the plant for all administrative and production areas and makes it possible to track materials clear through to delivery of the machine. "The objective," in the words of Helmut Stumpp, "is to perform all internal transport actions in such an efficient manner that the result will be a contribution to shorter machine throughput times, with a simultaneous optimal exploitation of all process capacities."

Individuality in series production

The new ARBURG concept was born during a visit to a ceramics trade fair in Rimini, Italy. One of the exhibitors there cut men's and women's rings from zirconium oxide solid stock in small lots with a corresponding diamond tool – and corresponding costs.

Nevertheless, as the PIM specialists at ARBURG thought, it would seem that there had to be an easier way to produce the rings at a more favourable price. The results of these observations have now been launched as an initial test series in the company's powder laboratory: rings made of metallic and ceramic materials – produced on ARBURG injection moulding machines.

The test series at ARBURG was run with zirconium oxide with several colours. In the test, a single-cavity mould for one ring was used. Taken by itself, the manufacturing process is not spectacular. The prepared material is injected into the mould cavity. It is then removed for an initial downstream heat treatment and debinding, which is the discharge of the plastic portion from the material. The following sintering operation helps the moulded part to its final form and strength. In the production of the rings, one more processing phase was added in which the rings were polished to a high gloss so that they would meet the high aesthetic demands of the purchasers.

"The greatest benefit of injection moulding here," explained Hartmut Walcher, who – together with Uwe Haupt – supervises the Ceramics Injection Moulding area at ARBURG, "is series production of accessories with consistent high quality that are still reasonably priced, because the production of the green body from ceramic or metal feedstock does not take more than 30 seconds." It is also the opinion of the experts that material savings of nearly 50 %

can certainly be anticipated within this technology, which – with a material price of roughly 200 DM per kilogram of zirconium oxide powder – amounts to serious cash.

And through this it is clear that large-scale production of perfect, high-quality precious jewellery is feasible with multiple-cavity moulds and high performance injection moulding machines without problems. In the test run, the rings were produced on an ALLROUNDER C with a special cylinder and a highly wear-resistant position-regulated 15 mm screw. The shot volume is 2.8 cubic centimetres, and the mould has fluid temperature controls.

However, the potential that results from the injection moulding technology in the production of jewellery is by no means exhausted with the production of rings. Other forms and surfaces with design emphasis may be realised just as well here – colour combinations achieved with the two-colour injection moulding, for example.

One factor that should be a source of pleasure for producers of jewellery is the short production times for large-scale runs with injection moulding. In the batch mode, the throughput time for the rings was approximately one week, whereby the product is ready for immediate sale following surface finishing.





Expertise in a concentrated package

In the sale of machines, availability of services has every bit as much significance as the machine engineering. For just this reason, ARBURG invests a great deal of time and money in training its Service Technicians. After all, they are the people who have to provide on-the-spot help with the problems that occur ever and again in the world of injection moulding. And that doesn't mean just with the new ALLROUNDERS. The people from Service have a solid understanding of the models from the '60's, '70's and '80's that are still hard at work in many injection moulding operations.

An independent department that is dedicated exclusively to training Technicians in Germany and internationally was created as early as 1984. In the international arena, this department is supported by the International Technical Support group (ITS).

93 Service Technicians trained

Today, a total of 5 training instructors with specialisation in the areas of applications, hydrau-

lic systems, electrical systems and electronics are employed at ARBURG. An assistant handles the entire administrative tasks for training events. A total of 93 technicians have gone through the training program, a program that lasts up to 15 months. This training of one year and three months also represents a noteworthy statistic because – in the VDMA average – only six weeks are devoted for training of new technicians in machine construction.

Employees in Germany are generally trained at the Lossburg headquarters. The technicians who are employed around the world are either trained in instructional blocks with their German team-mates, or they receive training and advanced instruction on-site from trained personnel. The training is rounded out by intensive courses lasting between one and three weeks. In these courses, the Service and Maintenance Technicians receive information about current products and their technology.

In April of this year, five employees concluded their training successfully, six more began training with the emphasis on service for machines of the C-series and S-series. Available to

the candidates is a Technical Seminar with a surface area of over 700 square metres. Collected there, in addition to the current product line, are all of the ALLROUNDERS that ARBURG has produced in the past years, so that it is possible to get real-world practice with all of the things that can confront one in field service.

Expansions to the existing training rooms are already planned, a move that is necessary because machines are larger on the one hand and, on the other, because the number of trainees is also growing. By doing this, ARBURG is paying heed to the condition that not only good machine technology, but also a comprehensive service program, are decisive in the buying decision. And the intent is to maintain the excellent evaluation this department has received from customers, or indeed to improve it.

Thorsten Grosse is one of the five brand-new Service Technicians who concluded their training on April 30 this year. The Master Electronics Technician specialising in energy systems spent 13 months in the Lossburg headquarters to learn all he could about electrical systems, electronics, hydraulic systems, mechanical systems and application technology so that he can give assistance to ARBURG customers. He describes his impressions as follows:

Mr. Grosse, are you looking forward optimistically to your new tasks following 13 months of training?

Absolutely. The training was so solidly-founded and comprehensive that I feel qualified in all the fields of ALLROUNDER technology. Of course, there's always a little stage fright before the first live appearance...

Speaking of comprehensive: It's clear that you are familiar with the latest ARBURG machine technology. But how does it stand with older ALLROUNDER models? Can you help out there, too?

Of course, we have to understand the technology of the machines that are installed at our customer locations. And those aren't just the S and C ALLROUNDERS. The most popular machines from the last 20 years are on hand in our training rooms. To put it simply, if one of my customers has a HYDRONICA or a 305 ECO that needs maintenance, he will get service that is every bit as reliable as with an "S."

A task that is so all-inclusive surely can't be covered going it alone. Who will support you when you have "run out of answers?"

If I can't make headway, I can fall back first to the detailed printed documentation that is available at ARBURG for every machine type. If that doesn't help, I can contact the staff of the Technical Service and confer with them to figure out where the problem could be. Nearly all problems can be isolated and solved by following this method.



We certainly wish you all the best for your future work and hope that you are spared from problems that are all-too thorny. What does the future hold in concrete terms?

Initially, I will make several customer calls with an experienced Service Technician, the "co-pilot," as it were, and try to resolve tasks together with him as they develop. Sooner or later, though, this last training activity is over. Then it's go off on my own responsibility and help out when there is a "machine SOS..."