

■ LEGO: Room for Imagination



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The key economic terms of our times are dynamism, internationalisation and globalisation. Certainly, no internationally active company can continue to exist today without adopting a strategic approach to the global economic market. At ARBURG, we follow these developments by way of our extended network of branches and representatives.

For us however, this is only one side of positive economic developments. The other is many years of partnership and continuity in tried-and-tested business relationships. In this respect, we in no way underestimate the importance of dynamic developments but we forge a very special relationship with our long-term customers.

In this issue, we want to present to you some examples of this very special type of relationship: For many years, we have had intensive contact with the world-famous toy manufacturer, the LEGO Group. Over the last few decades, two ideas have extended together around the world - one the multifunctional LEGO kits, the other being a multifunctional injection moulding machine, the flexible ARBURG Allrounder.

We are equally pleased with the well-developed business relationships with the companies Bosch/Waiblingen and Soehner/Schwaigern, with whom we enjoy traditionally trusting and close cooperation. We have congratulated Bosch with a certificate marking the delivery of the 150th ARBURG machine, and in the case of Soehner we have been able to celebrate the 100th machine.

These are only three examples from a long list. Examples which illustrate that ARBURG is always at the forefront of development from a technological point of view, yet at the same time continues to attach importance to continuity and teamwork with regard to business relationships.

With their individual production requirements, every customer represents a new, interesting challenge for ARBURG. A challenge which we are still only too pleased to accept - for our mutual benefit and as a basis for continued relationships.

We hope you find our new issue of ARBURG today both informative and enjoyable.

Eugen Hehl

Karl Hehl

An overall view for the benefit of our customers

The overall view of things is a tradition at ARBURG and is based primarily on the fact that highly-specialised machine systems are best planned, manufactured and serviced by those who also develop them.

The best example of this claim is the relatively high internal production depth of approximately 60 % for a mechanical engineering company. Our own quality standards, but also the work based on ISO 9001, are major reasons why this view is held at ARBURG.

Customer requirements are another supporting pillar to which ARBURG has always been orientated and in recent years, the company has clearly developed from being only a supplier of machines into an all-round service-provider for all aspects of injection moulding technology.

These services also include the complete worldwide service range offering customer

service, consultation, documentation and training, and also planning, networking, special processes, automation and peripheral devices.

In our case, many details show that the wishes of the customer significantly influence the development, production and sales of the Allrounder. The building-up of our own, worldwide network of branches is just as much a part of this context as the orientation of global services to the fully-developed system in Germany.

This is illustrated by, among other things, a team of trained sales consultants, networked, computer-controlled spare parts supply, telephone service, a flexible, easily reached customer service with a well-equipped vehicle pool and a comprehensive range of training courses for machine operators.

In addition, customer consultation makes synergy effects which arise from daily work

In the much-quoted times of "outsourcing", a strategy which integrates combined know-how in a central location may at first glance appear somewhat anachronistic. The ARBURG corporate philosophy follows exactly this strategy. However, a more precise examination reveals that this procedure is backed up by a system and careful thought, and the many years of continued success with the Allrounder technology justifies this method.

very useful. As a result, the customer who not only wants a machine but is also planning a complete injection-moulding shop or automated production with a host computer, quality assurance, mould change and the supply and disposal of the injection-moulded parts, will find exactly what he is looking for at ARBURG.

However, ARBURG applications technology consultants can provide equally comprehensive advice concerning questions about production islands, which are intended to combine in a single unit the various machine and peripheral components. Comprehensive know-how on special processing methods, powder injection-moulding or LSR, multi-component and CD production, as well as the design of moulds, round off the range of consultancy services.

At ARBURG, the positive effects of internal teamwork have a great effect on cooperation with the customer. However, this can only work if the communications routes within all the regions of the company are short and unbureaucratic. Only in this way can ARBURG keep that decisive step ahead of its competitors on the market. This is the way in which a corporate philosophy, which assumes that the lion's share of specific specialist knowledge

remains concentrated in the company, displays its great advantages.

The same applies both to the R & D sector and to production, as well as to the subordinate services. Despite all certainly profitable (from an economic point of view) "outsourcing" concepts, companies which produce highly-specialised technical investment goods can achieve top quality and a long life only if they can come up with most of the components required for this.

ARBURG has already successfully pursued this strategy for more than 70 years, and we do not intend to change it in the future. All important company departments will remain in a central location at the Lossburg headquarters in the coming years. This means that the company is also very well equipped for the new millennium.



The material which children's dreams are made of



They can be found in every child's room and there is hardly anyone who has never played with them: We're talking about the world famous LEGO bricks, an irreplaceable toy in most countries of the world. Whether they are red, yellow, green, LEGO Primo, the large DUPLO bricks or the LEGO TECHNIC system - the world-famous brand name has for four decades supplied the right plastic toy to suit all ages and interests.

And in so doing, the LEGO Group has been actively supported by the machine technology of ARBURG since 1973. Both halves of this constructive partnership have many significant things in common: For example, the names of both companies which, even in an era of large multinational groups, are still in family ownership, are made up of parts of several words and are thereby unique.

ARBURG was formed from the names of the company founder **Arthur** and the company's location **Lossburg**. The name LEGO represents a contraction of the Danish words

"**leg** godt" ("play well"). The fact that "lego" also means "I assemble" or "I read" in Latin, was only an extremely lucky stroke of fortune, and this was not realised until much later.

The products of both companies represent further parallels. Both became worldwide best-sellers following an inventive streak of genius: On the one side a versatile toy, on the other side the machine on which these children's dreams are made. The combination which benefited both companies.

LEGO: The rapid rise of an ingenious idea

The rapid rise of the LEGO Group to its position as one of the leading toy manufacturers on the world market which today employs 9200 people in 29 countries began in 1932: The company founder Ole Kirk Christiansen, who had run a joinery and carpenter's shop in Billund since 1916, was forced in 1932 (due to the dramatic effects of the world economic crisis) to stop production for agriculturally-orientated customers.

With the idea of now producing wooden toys for children, Christiansen scored a bull's-eye.

The name of this solid, quality toy was developed in 1934, and the product sold in large quantities from Danish retail outlets and among consumers.

At the end of the 1930s, the LEGO range was extended to include cars, animals, yo-yos and other wooden toys, with the result that the company produced about 150 different products and sold them in Denmark.

Plastic revolutionises production

One of the effects of military-related developments during the Second World War was the revolutionary development of plastic as a production material. As early as 1947, Ole Kirk Christiansen recognised new possibilities and set up a small injection-moulding shop with a machine in which rattles, small dolls, animals and building blocks were manufactured using the new material.

After the first, now very primitive-looking LEGO bricks ("automatic binding bricks") were developed in 1949, Godtfred Kirk Christiansen (the founder's son who was keen on fiddly things) came up with the pioneering invention, for which he then applied for a patent in 1958. With an internal tube system, the LEGO bricks gained their today famous clamping force. Thanks to their significantly greater stability, completely different designs and combination possibilities could be realised. In this way, the foundations of the LEGO success were laid in the true sense of the word.

The Danish toy company then concentrated fully on plastic in 1960, after a fire



had destroyed the entire stock of wood.

More than 110 billion parts

Today, the LEGO Group, the only European representative among the world's ten largest toy manufacturers, markets 515 different LEGO kits, consisting of 1964 different elements: The systems LEGO Primo, LEGO DUPLO, LEGO SCALA, LEGO SYSTEM, LEGO TECHNIC and LEGO Dacta have replaced the simple "LEGO box" with which everything began and which went on to lure generations of godfathers, mothers and young master designers onto the living room floor. Between 1949 and 1990, a total of about 110 billion LEGO elements were manufactured with this quality claim.

The basic LEGO principle

However, the basic principle always remained the same, manufacturing high-quality and educationally important toys, the individual elements of which must remain combinable throughout the world and for decades.

LEGO quality - Allrounders make it possible

The dictum of Ole Kirk Christiansen dating back to the 1930 - "Only the best is good enough" - still applies as one of the corporate principles of the LEGO Group. And ARBURG Allrounders, for which the ARBURG company has the same production principles, help to achieve this level of quality assurance.

Innovations on the toys market

Innovations will continue to have a decisive influence on the developments of the LEGO Group in the future: New ideas, new elements, new kits and new play subjects constantly give children new opportunities for playing, thinking and learning. For example, a CD-ROM has for some time been supplied with one of the LEGO TECHNIC kits, containing many additional instructions and exciting ideas for playing.

Every LEGO box addresses the inimitable nature of children's imagination and provides stimulation for realising the most varied design dreams. The almost unlimited LEGO possibilities are restricted only by the power of the imagination and by the age and devel-

opment stage of each child - and, of course, by the amount of components available.

Two ideas - one success

In the last few decades, two ideas have travelled around the world - one the multifunctional LEGO kit and the other the multifunctional injection-moulding machine, the flexible ARBURG Allrounder....

ARBURG marketing: Fully tailored to our needs

INFORMATION CENTRE



Dedicated, dynamic, expanding - the still very young Marketing Division at ARBURG can be accurately characterised by these key words. Under the supervision of partner Juliane Hehl, this division (made up of the Marketing, Advertising and Publicity work departments), was founded about two years ago.

With some 20 employees, the junior manager today has a strong team with a young average age of 32. This makes it a young division in both senses of the word, and one which is growing with its responsibilities.

Its range of tasks is a large one, with the traditional work of a marketing department having been precisely tailored to meet the special needs of ARBURG. To us, marketing is not simply marketing!

Always practically-orientated marketing

Of course, this should in no way mean that there was no marketing at ARBURG before 1995. On the contrary: For practical reasons, marketing responsibilities were concentrated more in other divisions of the company, primarily in the Technical and Sales departments. Marketing requirements and customer wishes have always consciously been given high priority at ARBURG: The economic successes of the 1950s and 1960s were based on accurate market analyses and the implementation of the

conclusions drawn from them. Pioneering and revolutionary developments like the ARBURG Allrounder itself, the digital controller or the Vario principle were developed from such development work which was orientated directly to production problems.

1995: The launch of the Marketing Division

Due to the successful global expansion of ARBURG which is now active in about 120 countries throughout the world and increasingly complex demands, in 1995 it became necessary to adopt a systematic approach to marketing procedures by forming a separate division.

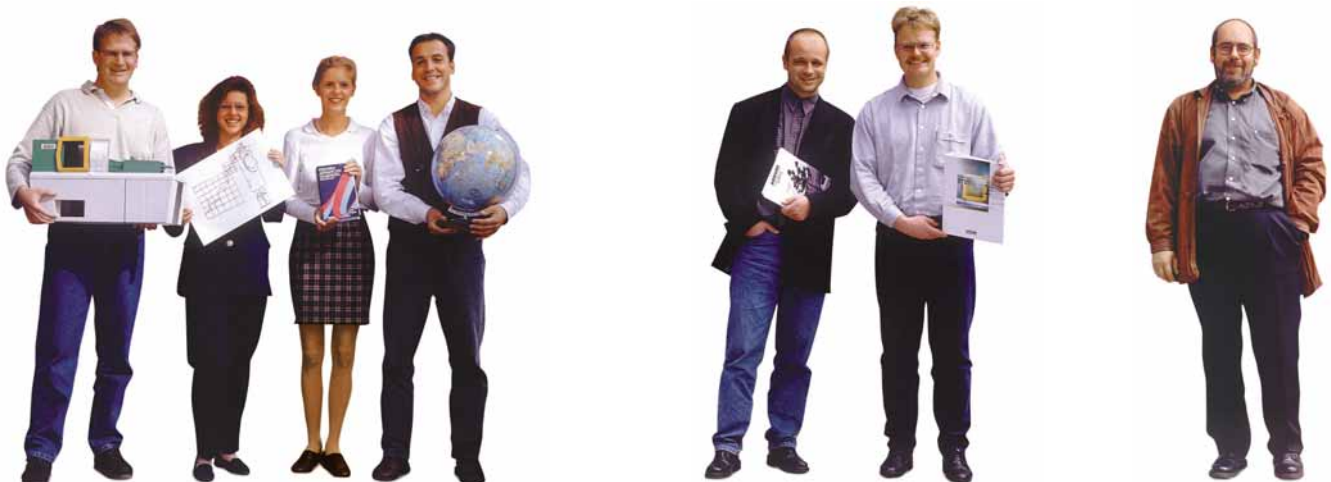
Market and competition observation, portfolio analyses, location analyses, reports from German and international sales - all of this work today makes it easier for decision-makers at ARBURG to accurately estimate markets and developments and to act with a wide entrepreneurial view. The division forms the interface between the market, technology and sales, and also be-

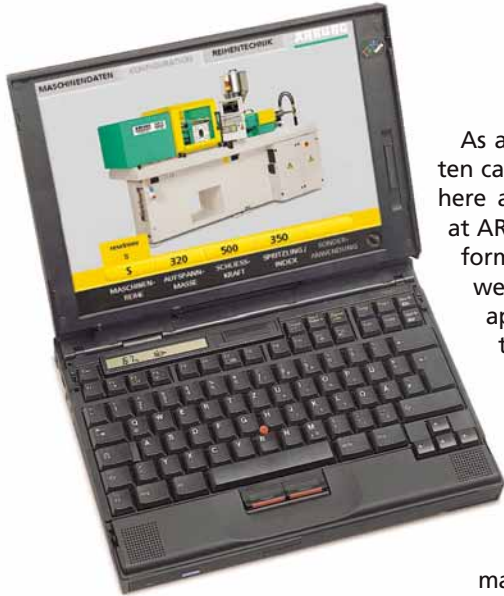
tween the parent company and the 18 subsidiaries, as well as numerous trading partners.

Advertising and publicity work

In addition to the Marketing Department, the responsibility for advertising and publicity work also lies with the Marketing Division, where all sub-divisions work together in close cooperation. Here, all tasks are covered by graphics, photography, exhibition designs and texts.

Thanks to its excellent technical facilities, the advertising department is without doubt one of Germany's leaders for a company of this size. For example, with an extremely modern digital printing machine, one of the few machines of its type in Germany, ARBURG is able to react flexibly and in an order-related way to many different demands. As in machine production, ARBURG also attaches great importance as far as communication is concerned to dealing with most tasks internally in order to be as independent as possible from external influences.





Modern and proven means of communication

This also applies to the numerous other tasks involved in advertising and publicity work: Whether we are talking about the most up-to-date forms of communication like multimedia applications as tools in consultation and sales discussions and the refined range of Internet services, or proven information methods like mailings, brochures or even the ARBURG today customer magazine - the Advertising Department works to professional standards in all fields.

As a result, things which often cause astonishment elsewhere are no longer surprising at ARBURG: In addition to information media on paper, we also have multimedia applications on CD ROM or the services of the Internet, complete and located centrally in the Advertising Department.

Here, short communication routes allow rapid action and therefore quick information - an advantage which our customers also appreciate. Because, in the final analysis, all our efforts enable us to optimise internal procedures to the benefit of our customers and to offer them comprehensive information as quickly as possible.

An international character is ARBURG's trump card

And thanks to the superb worldwide contacts of ARBURG, we can offer this in numerous languages. For example, ARBURG today appears in five languages (German, English, French, Italian and Spanish). Brochures are sent in thirteen,

mailing campaigns in as many as fourteen different languages. The complex translation work is coordinated by the Marketing Department, with the Advertising Department assuming responsibility for implementation and production. This means that an increasing number of people throughout the world are able to obtain ARBURG information in their native language.

Publicity work - an important information instrument

Another important cornerstone for providing our customers and interested members of the public with rapid and comprehensive information is the national and international press.

Whether you are interested in specialist articles, exhibition previews, background information or ARBURG today - ARBURG Public Relations supplies over 100 media internationally with many items of new information and things worth knowing.

INTERNET

www.arburg.com

At this address you will find our varied ARBURG Internet service. It allows you to take interesting walks through the ARBURG company.



At the click of a mouse, you will receive comprehensive information on technology, the company's history and our services - up-to-date and extremely quickly.

Pay us a visit!



"Marketing" continued

To the benefit of ARBURG and the customer

The staff of the Marketing Department, under their boss Juliane Hehl, have set the aim of providing a service to the benefit of ARBURG and therefore, of course, also to the customer. This is because that which allows ARBURG to act quickly on the market and with a world view also assists the customer in optimising his technological standard, thereby also optimising his production from a qualitative and economic point of view.



For rapid and effective communication: The digital colour printer is connected on-line with the DTP workstations of the Advertising Department and provides top quality printing "on demand"



Plastic: Material with a future for jobs with a future

"Plastic" occupies an important position today in both the economy and society. In daily life and also in high-tech fields, there is an increasing number of products made of a very wide range of materials which fall under the heading "plastic" and which make work, research and life in general easier.

This means that professions which deal with "plastic" are also future-orientated professions. It is not absolutely essential to have studied in order to be involved with plastic at work. Training as "plastic mould shapers" prepares young people for a profession which, in contrast to many others, is extremely flexible, secure and at the same time varied.

Well-founded training

ARBURG has for many years trained plastic mould shapers in cooperation with the regional vocational schools. The infrastructure provided by the company for solid training is very clear: State-of-the-art computer systems and machine technology, a stringent teaching concept for all those starting out in their career, instructors who are always well informed of the latest developments because, besides providing training, they are also constantly training themselves further.

Educational requirements

The educational requirement for employment as a plastic mould shaper specialising in injection moulding systems is a junior high school certificate. Training always starts at

ARBURG in September of the relevant year. The training period is three and a half years. The closing date for applications for all potential trainees is, in each case, the end of September in the year before the planned commencement of training.

Main emphases of training

The main emphases of the training can be divided up into machine-related, plastic-related and quality-related subjects. Among other things, trainees learn to set up and inspect injection moulding machines according to a protocol; they learn the design and function of machines and moulds; important facts on sprue designs, handling devices and technical accessories, and also work in internal production on Allrounders using the company's own moulds. After three to three and a half years, they then take the Chamber of Industry and Commerce Skilled Worker Examination.

Areas of work following training are application systems, the injection-moulding shop and machine acceptance.

The right company infrastructure

Trainees and students who are starting out on their career at ARBURG can expect to find a company equipped in accordance with the latest standards, together with a pleasant working environment where partnerships and teamwork are the main aims.

Trainee wages are always in line with the relevant valid collective bargaining agreements. Trainees are also entitled to holiday and Christmas pay, meal allowances, free teaching and learning aids, as well as a travel allowance and bus transfer to the company. The flexitime



rules can also be utilised to the full by new employees. Computer training and specialist internal training courses are also available to employees.

Ideal conditions

All in all, trainees at ARBURG find ideal training and working conditions, which have a positive influence on their enjoyment of their training. And by also learning a secure profession like that of a plastic mould shaper, nothing more can go wrong at the beginning of their career. And if the necessary enthusiasm is combined with performance, an internal promotion may also be a possibility.

FACTS

Training
Plastic mould shaper

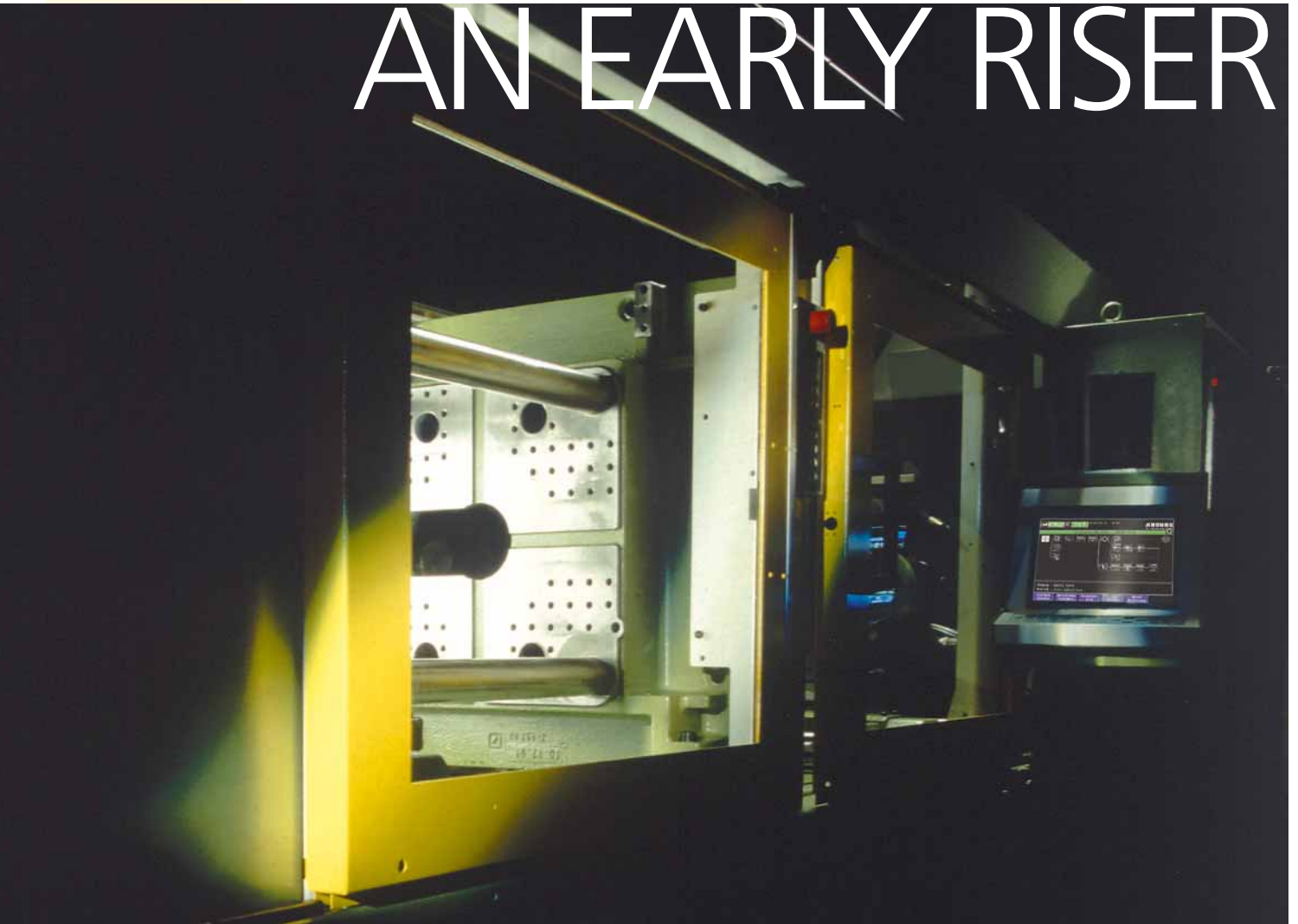
School-leaving certificate:
Junior high school

Training duration:
Three or three and a half years

Final examination:
IHK (Chamber of Industry and Commerce) examination

Automatic start-up and switch-off: Operating and convenience benefits on the Allrounder V

AN EARLY RISER



Additional control features on the Allrounder V are presented in a user-friendly and convenient way to further enhance automation of the production process. The possibilities of switching the machine on and off automatically are particularly interesting. Here, many adjustment variants allow the Allrounder to be specially started up in a tailored way for production requirements, as well as enabling operation to be ended. These control components are becoming particularly important in the automation field, when mould-changes, material changes or colour changes are used.

Three different switch-on and switch-off alternatives are possible as standard on the V machines: Switching on and off with setpoint value control, switching on and dosage, and also switching off with different variants.

Switching on and off with setpoint value control

Automatic switching on and off with setpoint value control takes place on a time-related basis. The various temperature levels are approached independently in this case. It is pos-

sible to determine via the sequence editor whether the Allrounders should only be switched on and off, or whether they should be put into and out of operation via temperature reduction, setpoint values or release temperatures. Every

operating mode - whether it is standby, automatic or preheating / time switch-on, are assigned different temperature levels for the various machine components.

A maximum of cylinder heating, machine cooling, hot runner and mould heating, temperature control units and the Thermolift can be addressed via various interfaces. Cooling and the Thermolift can be switched on and off. All other temperatures can be defined via setpoint values. The switch-on and switch-off times of the machine are each entered daily in a tabular mask.

Switch-on processes

Switching on of the machine can be automated in four ways: "Switch on only", "Switch on with dosage", "Switch on with start up injection cycle" and "Switch on and dosage with automatic start". The dosage procedure is subdivided into various parts and can therefore be activated on a machine-orientated basis. It can either remain completely switched off, the nozzle can be retracted, the unit can be dosed over time, purged and again dosed to the defined setpoint value (start up injection cycle). Production can then start by pressing a button manually or automatically with the existing reference cycle (guaranteeing a free cavity before starting production).

Automatic switch-off of the Allrounder

The machines can be switched off automatically either via time, at the end of the relevant order or via the alarm time. In this case too, the various functions can also be carried out. It is possible to switch off in conjunction with "close mould", "close mould and

purge" and with "close mould, and approach the screw removal position". In all three machine states, the temperature levels in "standby" mode and in switching-on of the Allrounder can be freely selected.

The varied program segment of the Selogica controller for automated switching-on and switching-off is particularly appropriate when, for example, unmanned material changes or mould changes are performed. This enables important preparations for such changes - which the operator would otherwise have to carry out (dosage, purge, preheating) - to be made via the "Time" feature.

The switch-on and switch-off functions can be set in shift operation so that, for example, an operational Allrounder is ready for production immediately at the beginning of a shift. These functions enable the Allrounder V to be preset even more flexibly and therefore operated more conveniently. For complex production sequences, this means an efficient simplification of work and time savings.



PARTNERSHIPS

150th ARBURG machine for Bosch/Waiblingen 100th machine for Soehner/Schwaigern

Recently ARBURG thanked the companies Bosch (Waiblingen) and Soehner (Schwaigern) for many years of positive cooperation. The chairman of the Management Board Eugen Hehl presented certificates to mark the delivery of the 100th and 150th ARBURG machines respectively, marking the traditional close cooperation between these two companies and ARBURG.

ARBURG - Soehner cooperation

During his visit to Schwaigern (photo), Eugen Hehl said that he was certain that the good business relationships between ARBURG and Soehner would continue to bear fruit in the future. Since then, another four Allrounders have taken their place in the production halls since the anniversary machine was installed. "And further proof of our positive relationship - if such proof is necessary - is the fact that you possess machines from almost all parts of our machine range. This is a sign of your confidence in the high-quality work of ARBURG!", said Eugen Hehl enthusiastically.

ARBURG - Bosch cooperation

We have been able to celebrate the handing-over of the 150th machine at Bosch in Waiblingen. On this occasion, Eugen Hehl emphasised that ARBURG and Bosch are connected by a double business relationship: In this special case, both partners are suppliers as well as buyers.

ARBURG supplies machines to Bosch and in turn buys components which are required for machine production. In the true sense of the word, both companies are in a mutually profitable economic relationship.

Good ideas as a foundation for reliable partnerships

Both anniversaries prove that the tried-and-tested and at the same time still innovative ARBURG concept of a small, versatile machine promotes excellent, mutually beneficial business relationships in the long term.

This is a fact which many customers appreciate, and have done for many years.

A Declaration of Independence



The statement "at our place, the heat comes from the heating system and the electric current comes from the socket" may apply to individual private households, but for a long time this has no longer been the case for large industrial companies. The emphasis here is directed much more towards testing and finally using systems which utilise valuable primary energy as optimally as possible. At ARBURG, we are always searching for innovative solutions which reduce costs and at the same time are helpful in providing all types of energy for the company.

Since January 1997, the results of this have been in operation in the thermal control centre of the company: Since the beginning of the year, the new block-type thermal power station has not only supplied the central heating system, but has also fed electric current into the company's own electricity network. Previously, the gas-operated and encapsulated MAN twelve-cylinder had to run for approximately 8000 operating hours per year, equivalent to 24 hours round the clock. Today, it is necessary to heat the water up to 80 °C for the environmentally-friendly, water-based powder coating

cleaning baths for machine parts.

Whereas it was previously possible to switch off the boilers after the end of the winter heating period (October to April), as the required hot water was heated by a heating pump, today the additional energy which is required is used by the block-type thermal power station to heat up the baths. The heating boilers remain in "standby" mode during the summer, and in an emergency would be able to supply the power.

Power generation as a "secondary product"

As the combined heat and the power system is operated with heat conduction, the electric current of the system is obtained almost as a waste product, which is fully utilized by feeding it into the company's internal network.

This also explains the system's very high efficiency (approximately 90 % (!)) compared with other systems currently in use. This was also shown in the economy inspection which ARBURG had carried out by an independent expert before purchasing the system.

The combination of a gas combustion motor with a current generator, according to the résumé, is both economical and ecologically sound.

The 290 kW electrical output of the block-type thermal power station could supply 150 average households. The thermal output is approximately 470 kW. Assuming these figures are accurate, the system costs are recouped in continuous operation after only three and a half years. These were figures which clearly showed the company's decision-makers that this investment would definitely pay for itself.

The environment also profits

However, the environment also continuously benefits from the system's use. The approximately 1 million kWh of electrical energy and more than 1.6 million kWh of thermal energy produced by around the middle of the year emitted into the atmosphere 1570 kg less CO₂ and 1400 kg less nitrogen oxide, compared with the previous heating system.

3526 kg less sulphur dioxide each year

However, the greatest reduction is in the amount of sulphur dioxide emitted. In this case, 3526 kg less pollutes the environment, corresponding to a percentage reduction of 99.65 % (!) For a company located in the Black Forest, this is one more very clear reason for changing over to an effective energy system, when one considers that with the normal, separate production of electricity and heat, up to 72 % of the energy used is lost.

ARBURG bought the system as an optimized complete solution, including an electronic controller, for fully-automatic operation. In this way, all significant data such as operating hours, hot water temperatures and any faults can be processed and displayed. The switching system includes a power section, measurement, switching and control unit for auxiliaries and the machine controller.

The system is always run with heat, in other words at optimum efficiency. Changes in the factory had to be made for integration into the existing heating system and for feeding electric current into the existing 20 kV network of the company.

A further step in resourceconserving production: The ARBURG block-type thermal power station

The future will bring further expansion

An extension of the block-type thermal power station is already a definite part of internal company planning. Three additional locations for combined heat and power systems are already prepared. This is because with regard to the building's air-conditioning, the intention is to no longer produce the coolness with the existing cooling machines (CFCs). Instead, the intention is to obtain absorption cooling machines which produce coolness from heat based on the water evaporation principle.

However, the fact that no energy is wasted at ARBURG is illustrated not only by the use of such systems, but also through the utilization of the company's "waste products". Anyone thinking that the motor heat emissions of the block-type thermal station dissipate unused is mistaken: Instead, they are used to provide optimum heating for the adjoining rooms.



IN BRIEF

A world premiere: ARBURG is presenting the extension of the S range at the Fakuma 97 exhibition in Friedrichshafen. The successful, innovative series is being continued in the upper closing force range with the Allrounders 370 and 420 S. These new Allrounders represent another stage in the completely modular extension of the S range.



Professional debut: With 34 new trainees and vocational academics, ARBURG took on at the beginning of the new training year in September three more newcomers than was originally planned. This means that ARBURG offers a total of about 100 young people training places, thereby making it clear that investment in training means investment in the future.



Training debut: An ARBURG Allrounder 220 S plays a key role in an interesting training project run by the Baden-Wuerttemberg regional museum for technology and labour in Mannheim. Trainee plastic mould shapers and vocational school students specialising in mechanical engineering are given a very successful introduction to plastic injection moulding using both modern and historical plastic machines.

Top-Service in the "New World"

Since 1991, ARBURG inc./USA based in Newington, Connecticut, has been responsible for supplying Allrounder customers in the company's largest single regional market outside Germany. Over 100 qualified employees - 60 full-time staff plus 40 representatives in all parts of the country - work for the American branch in the Sales, Spare Parts and Service Divisions. Experts in application and control systems provide rapid assistance if there are any problems. Regular training courses in the company's own seminar rooms, as well as possibilities for testing moulds and machines, complete the wide range of services in one of the hardest markets in the world.



The most important thing: ARBURG makes sure that the distance between it and the relevant partner is short, even in the enormous countries USA and Canada. This also allows customers in the "New World" to be able to rely on rapid supply with the latest information, state-of-the-art Allrounder technology and all necessary technical components.

The main characteristic is the efficient increase in machine sales in North America. This strategy was extremely successful last year: ARBURG succee-

ded in almost doubling Allrounder sales, and an end to this boom is not yet in sight. The list of customers continues to grow in both the small and medium-sized injection moulding machine sectors. This is despite the fact that in the USA, large domestic suppliers with decades of home advantage in the fields of sales and service (as well as strong Japanese competition) adopt a much more aggressive and higher profile than in Europe.

ARBURG in North America: Historical growth

As early as in the 1950s ARBURG began to work the market "across the pond" with its own representative. The company "Polymer Inc." based in Berlin just a few kilometres from the current location in Newington then assumed responsibility for Allrounder sales and service for more than 25 years, up until 1991. Since the beginning of the 1990s, ARBURG has itself taken over the business of Polymer. The market position which ARBURG

Ideal distribution:
The ARBURG ATCs ensure comprehensive coverage of the North American market.



currently occupies in North America does justice to the company's long tradition in the region. ARBURG counts approximately 25 % of all injection moulding machine customers in the USA in its own clientele. With over 12,000 sold machines so far, the Lossburg company occupies a place in the top group of European injection moulding machine suppliers.

Taking into account regional factors

When working North American market, ARBURG has to take into account specific national factors. Firstly, American customers also want to be served from America. This means that as wide an "on-location presence" as possible is absolutely essential. Since US customers normally make their purchasing decisions much more quickly than is normally the case in Europe, this also requires a certain amount of Allrounders of all sizes to be kept in stock directly at all support points in North America. Finally, in almost all cases, only Dollar invoicing is accepted, irrespective of how the exchange rates are at present.

ATCs support the headquarters in Newington

Including the main headquarters in Newington, there are five regional ARBURG technology centres (ATCs), the others being in Spartanburg / South Carolina, Chicago / Illinois, Los Angeles / California and Dallas / Fort Worth, Texas. Together with the service vehicles, these form a customer service network which provides the company's business partners with complete technical support in all matters relating to injection moulding.

The regional ATCs are administratively subordinate to the headquarters in Newington, with all branches also being connected online with Lossburg via the Navision communications system. This allows the direct disposition of machines and spare parts round the clock. In other words, it does not matter whether we are talking about technical services or customer service: The most direct routes possible are in all cases intended to guarantee that the customer is supplied quickly and fully.

The geographical size of the market alone made a rethink in all areas relevant to machine sales absolutely essential. The USA was divided up into a total of five different sales areas, which correspond to the locations of the technology centres. The division was based on intensive prior studies of customer structure and distribution.

This subdivision makes ARBURG and its services so strong that it can stand up to any national and international comparison in the USA and Canada. Technical training courses, mould tests, technical application supervision or test injection mouldings are effectively supplemented by, for example, regional open days at the ATCs. This comprehensive range means that ARBURG is continually present near all customers and interested parties, something which forms the basis for constant dialogue and therefore positive business developments.

"MSV program": Exemplary like in Germany

The fact that the consultation activities in the USA are completely orientated to the German model, albeit without neglecting the necessary adaptations to the North Market requirements, is important in this context. This also applies, for example, to the current fleet of 17 service vehicles which, with their comprehensive range of equipment and spare parts inventories, arrive very quickly to render assistance, even in the event of unusual faults.

ARBURG is the only injection moulding machine manufacturer to use such a mobile supply system in the USA. However, the customer service busses are not only equipped with all necessary measuring units and Allrounder components. They also have state-of-the-art telecommunications. Mobile phones, mobile radio and portable fax machines not only enable service technicians to be contacted anywhere, they also permit the rapid transfer of customer data, circuit diagrams or repair instructions. This makes every van a mobile office, something which allows effective disposition and customer supervision between jobs.

The aim of the expansion of the "MSV program" (mobile service van program) which has been going on since 1993 is to have as many customer service busses in operation so that no single vehicle has to cover a radius of more than 200 miles. Here, ARBURG is primarily investing in the satisfaction of customers who already appreci-

ate quick access to know-how and assistance.

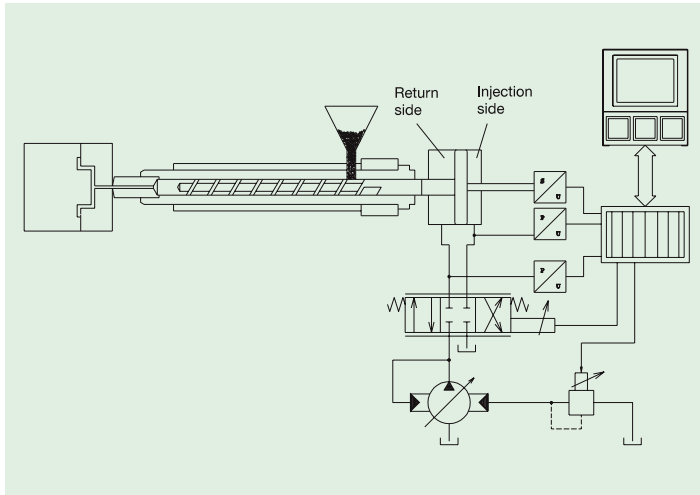
The customer services are completed by a telephone diagnosis service, which efficiently remedies minor faults by way of telephone consultation. Here, use is made of the fact that the individual service stations can also act with appropriate flexibility to customer enquiries, given a time difference of up to three hours. In plain language this means that when it is the end of the working day on the eastern seaboard, customers can benefit from up to three more hours of personal consultation simply by way of a diverted call to the Westminster ATC.

Expansion with clear aims

The ARBURG strategists have further expansion in the States firmly in their sights for the medium term. Sales figures should double in the coming years. The aim is to achieve this by further investments in the infrastructure, and also close cooperation with the Lossburg headquarters. This corporate philosophy has also borne fruit in the other regional markets.

And something which has proven successful in Europe and Asia can't be entirely wrong for North America, as far as the approach is concerned.

Controlled or regulated: The difference is in the detail



The principle of screw position regulation: The accuracy of the pressure regulation assists precise screw positioning

Dialogica and Selogica machine controllers allow rapid, high-precision action in the injection process.

After dealing in the first section of the report with the theoretical principles of controlled and regulated injection control, and also the Allrounder with Multronica machine controllers, the second part deals with the action possibilities available on machines with Dialogica and Selogica controllers.

In general, Dialogica and Selogica differ primarily from Multronica controllers by way of their greater computer capacity. The Dialogica is a 16 bit multi-processor controller and the Selogica is a 32 bit multi-processor controller. This allows more parameters to be incorporated into and monitored in the injection process, and also the switching speed of the valves is significantly faster, which results in greater uniformity of the injection process. The hydraulic system operates with two hydraulic manifold, one of which is assigned to the

clamping unit, with the other one being assigned to the injection unit.

Position control of the screw

Both controllers allow injection with a position regulated screw. On all Allrounders of series S, C and V, the regulation valve is directly on the injection unit. The valve can optionally be fitted to the injection unit in such a way that, as a result of a short oil column, the dynamics are further increased during injection. A second regulation valve on the hydraulic manifold is used for pump control.

Two pressure sensors installed directly on the injection cylinder measure the pressure conditions in both cylinder chambers, and therefore also the differential pressure. In this way, the screw position can be precisely regulated both during injection and for maintaining the reached position. During this process, the screw is "clamped" between the pressures in the two cylinder chambers, i.e. it is positioned exactly. A special injection regulation

board is used for this system. A regulation board is also used for the back pressure. The screw is therefore position-regulated, and the back pressure and screw speed are regulated.

Advantages

The accuracy of the pressure control is increased due to the fact that forces acting on the system from the outside, such as flow resistances of the materials, are effectively compensated for.

A hydraulic accumulator is available as an option with the S, C and V Allrounders which can be combined with position regulator. It meters additional accumulator energy via a control valve. This guarantees full position and pressure regulation, even in the case of very high injection outputs.

With the possibility of running the mould protection with pressure regulation, it is possible to avoid pressure peaks when switching over to the

various pressure stages. This significantly improves the quality of parts, and shortens the cycle time by increasing the operating speed.

The advantages which regulation of injection speed, injection flow and injection pressure provides compared with control of these parameters are as follows:

- A constantly high parts quality
- Continuously narrower tolerances
- Less scrap due to the independence of the regulation system from ambient influences and
- Shorter starting times

Thanks to the fast regulation valves, the machine movements can be mastered with even more precision, particularly during the switchover processes.

Ideal mould internal pressure - and hydraulic pressure curve of an amorphous plastic

