

ARBURG

today

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From Western Forts to Fairy Castles: Playmobil



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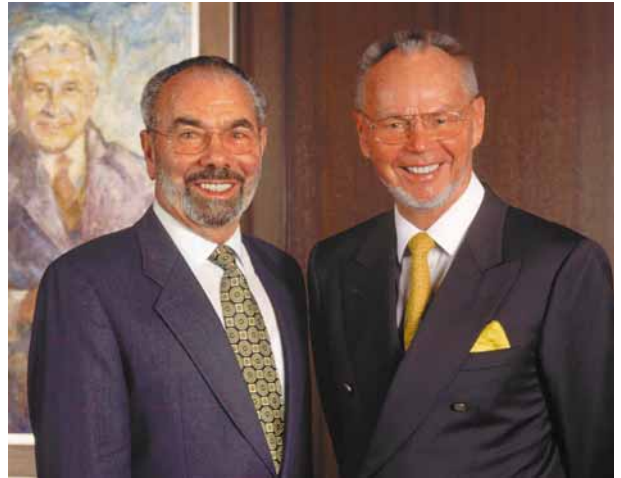
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After its Golden jubilee year, which also included what we consider a highly successful K fair, ARBURG is making the most of the excellent trends of this year and is full speed ahead with new work. Those who know us know that we never rest on our laurels, but always meet the challenges of the future with a positive approach.

So it will come as no surprise that our company has in the past year achieved outstanding results in comparison with previous years. ARBURG achieved DQS (German Association for certification of Management Systems) certification in accordance with DIN EN ISO 9001 and 14001, obtaining dual certification.

Our successful Jubilee edition ALLROUNDER C JUBILEE replaced our former C-series at the beginning of 1999 due to great demand: the design of tried and tested machine technology and the latest SELOGICA operating philosophy were enthusiastically received.

With our ALLROUNDER C, S and 221 K ranges, we offer a streamlined ultra-modern range of models of uniform design and universal SELOGICA operating platform. With this range we have modified our old, much-copied modular system in a completely different way.

There has been progress in other areas of ARBURG's activities too: the new building for our ARBURG production workshops will see the dawn of a new age for our company, both architectonically and in terms of machine technology.

We hope you enjoy your latest edition of ARBURG today and that you find it informative.


Karl Hehl


Eugen Hehl

LOOKING BACK ON K'98



K'98 was a total success for ARBURG! And not just because of a knock-out stand. The image of the future for a major impact with the latest technology in a uniform design!



An atmosphere of well-being: it was not until late into the evening that peace descended on the ARBURG Jubilee stand. The stand thronged with visitors throughout the entire day. Both the uniform design machine range and the overall presentation, achieving an impressive combination of past, present and future, drew tremendous approval.





Investing in the future

ARBURG II – A project that will see the dawning of a new age

This project is much more than a new hall or extension. It is a completely new plant that will literally rise from the ground next to the existing company complex by the turn of the millennium.

Major efforts are needed to create the new production units and 150 new jobs. In total, the buildings will cover an area of

some 20,000 m² by the end (about 40,000 m² of useful surface area), with conversion of some 240,000 m³. ARBURG previously had around 100,000 m² of building area, which means that the existing plant will be expanded by some 20 percent.

With the cornerstone laid by ARBURG associates on 14 August 1998, the starting shot was fired for one of the largest coordinated building projects that the Loßburg group of companies has undertaken.

Excavations for the first part of the project took 12 weeks. In total, some 150,000 m³ of earth had to be moved. Looking to the future, the building owners decided to double the volume of earthworks, to obtain the land necessary for future development. 110,000 m³ of rock excavation was undertaken by the earthworks contractor. ARBURG is in

fact building on rock and into the earth for logistical reasons. The company is thus keeping to its policy, blending the new plant as carefully as possible into the landscape.

Data and facts that speak for themselves

The building project is divided overall into five different project stages (PS). It will start with the "Pipework" to provide the necessary connections with the foul water and rainwater drainage systems between the existing plant and the future extensions.

Building stage 12 will later house the wet lacquering and powder coating lines for machine components, building 20 will



The fourth Hehl generation at the cornerstone

house the "works link" between ARBURG I and II, designed as a logistics bay with a ready-built storey to the office tower, project stage 21 covers the assembly bay with a total surface area of 80 x 96 m plus 16 x 170 m access road. Other service buildings will also be constructed.

As far as building costs are concerned, Chief Site Manager Manfred Wolfer, the authorised representative of the building owner, Hehl International GmbH prefers to keep a low profile. A figure running into tens of millions DM seems realistic, but including all the production units another figure is likely to be added before the decimal point.

Despite this awesome task, the actual buildings should in fact, according to the architect, be completed in just two years.

Impressive figures

Asphalt work for roads and parking areas around the new buildings will alone require some 12,000 m² of surface area. The overall excavation work amounts to some 300,000 m³, with the earthworks contractor excavating 4000 m³ each day. For comparison, a large family house requires about 300 m³, i.e., a volume representing some 1000 houses will be excavated in order to build ARBURG II. The land on which the new work bays will be built corresponds to an area corresponding to four football fields at 150 x 230 m approximately. Some 20,000 m³ of concrete will be required to build the bays to this size.

ARBURG II will be founded on variegated sandstone

The project will involve moving vast quantities of variegated sandstone from the «Loßburger plate». At peak times, six dumper trucks (HGV) with a tare weight of 40 tonnes each (total weight some 70 tonnes) as well as scoop load-



ers and track-mounted vehicles were in operation on the site. About 80,000 m³ of the stone was broken up on site and re-used as hardcore. In addition, a further 10,000 tonnes of variegated sandstone blocks were set aside and offered for garden construction and landscaping.

Project 12: Wet lacquering and powder coating line

The useful surface area of this building will cover some 5,000 m², with a prefabricated concrete box roof construction with spans of about 28 m. The entire bay will be sprinklered and equipped with a goods lift of 16 tonne capacity. The existing powder coating installation is scheduled for a move in summer 1999. Here again, things will have to move quickly: production shutdown of just two weeks is planned during the works holidays.



Project 20: Logistics bay

This part of the building covers a useful area of 6500 m², offering further storage facilities of around 5000 m². The basement of the bay houses a sprinkler tank with a capacity of 1500 m³. A comparison will again serve here to illustrate the size of this: a swimming pool of external dimensions 20 x 10 x 2.5 m has a volume of 500 m³. With a water storage capacity of three times this, up to 20,000 sprinkler heads can be supplied.

Project 21: Assembly bay 80 x 96 m

The assembly bay will have the largest useful surface area by far at 18,000 m². A converted area of 131,000 m² will be adjoined by an access road. A total of 80 (!) crane installations with a carrying capacity of between 2 and 32 tonnes will be distributed throughout the bay. At this point it is interesting to note that the company has also looked to the distant future in its overall plan. The idea is to be able to reproduce this building section as an "ARBURG module", without re-designing each time.

«Low heating energy bay»

This building will be exceptional in other ways too: ARBURG will be using an energy technology developed in close conjunction with the Fraunhofer Gesellschaft. Loßburg will have a low heating energy bay.

A highly complex facade construction method and building technology and the use of waste heat from the production lines will help conserve energy resources.

Disposal buildings

The building measures are complete, with the disposal building designed for 14 container spaces and one large container. The building design is a covered rotunda structure with an external diameter of 42 m. The floor is designed as a concrete structure that is impermeable to water, in view of the use of the building.

The extensions for the ARBURG II complex seem mere "details" after all these figures. The plans include a large garage for the vehicle fleet, a service centre in which trades working in-house (joiners, locksmiths, painters, bricklayers) will be accommodated with their workshops, and a gate-house with a new access. The guards will then take over the task of logistics management. Access to the works area will have hard-shoulders for HGVs to prevent traffic problems arising from the outset.

A decisive step into the future

With the cornerstone laid for ARBURG II, this represents a very decisive step into ARBURG's technological future. The expansion of production capacity was necessary due to a strategic decision by the company of exceptional importance: in future, machines with a mould clamping force capacity of up to 4,000 kN will be produced. This will mean different, larger and more flexible production facilities.

Or in the words of Eugen Hehl when the cornerstone was laid: "We decided to make this far-reaching investment and achieve our great plan true to the old saying: 'If you don't grow, you get smaller'."

From Western Forts to Fairy Castles

How can you be a bike rider, an Indian, a Western hero, a pilot, a knight, an adventurer, a train driver and a trucker in less than an hour?

Easy – it's child's play! Just as long as your children have Playmobil at home. And Dad can go back to his boyhood too!

The company responsible for the continuing success of the Playmobil brand name is Geobra

Brandstätter GmbH + Co. KG which is based in Zirndorf.

According to them, the success of the Playmobil range started in 1974 with the ARBURG ALLROUNDER. Out of this, a friendly partnership developed, reflected amongst other things in sales of more than 250 machines.

The roots of the Playmobil manufacturers go back to 1876, when Andreas Brandstätter founded the firm of the same name in

Fürth in Bavaria. The first products made were cashbox linings and locks, and then in 1908 Georg Brandstätter, the son of the founder, took over operations. It was at this time that the company adopted the brand name "Geobra", made up of the first syllables of GEOrg BRAndstätter's first name and surname.

The move to Zirndorf, where the firm still has its head offices, took place in 1921. According to the trade register, Geobra's business was the "manufacture of metal goods and toys and the marketing of these".

The arrival of Horst Brandstätter in the firm in 1954 heralded a new era. The company discovered plastic as a material in itself and for production.

Just four years later, the company achieved major success with the manufacture of hula hoop rings. The production method used to make the rings could also be modified as a blowing method for making toys. Pedal car trailers, boats and racing cars as well as piggy-banks were now added to Geobra's production range.

Flexibility as the basis for success

Flexibility was the order of the day as the competition was not far behind. Structural foam parts with the corresponding machinery and tooling were another stalwart.

Ceiling panels, children's desks, shop fittings, tennis racquets and even water skis were all included in the production lines at that time, which the company sold in large quantities.

The oil crisis at the beginning of the Seventies and the consequent shortage of materials, drastic increases in the price of plastics and attendant pressure on costs from low-wage countries

created major difficulties for the family firm.

Introducing new ideas to combat a situation such as this is not the usual path to choose, but that is what Horst Brandstätter did. He resolutely put a new plan into action, a system toy that could constantly be added to with new figures and scenes, with small parts that made the most of expensive plastic.

Playmobil was born, and was first introduced at the international toy fair in 1974. After initial scepticism on the part of buyers, demand from children and their parents produced success within the year, which is still holding good today and has long had no parallel in the German toy industry.

Playmobil in figures

Just a few years after the introduction of Playmobil on the market, the company had the highest turnover in Germany for toy manufacturers and has stayed at the top ever since. By 1997 the group was employing 2,200 people worldwide.

There are European Playmobil marketing firms in France, England, Benelux, Italy, Greece and Spain. These will be further extended by locations in the USA, Canada and Mexico to cater for the American market. The Brandstätter Group also includes the computer firm Hob Electronic, the mould-making firms Brandform and Inmold and two foreign production plants in Malta and Spain.

1997 was an exceptional year for the Brandstätter Group in two respects. Not only was Playmobil able to sustain 13% growth in the general downward trend of the German toy market, but the consolidated group turnover passed the half a billion mark at 504.1 million DM. Playmobil sales worldwide of 440 million DM included some 60% from abroad.



playmobil



Playmobil is now sold in 65 different countries and at international level is a best-seller in the toy market.

Playmobil's market share in Germany has increased by 6%. In 1998 the toy system is as up to date as ever. With the SystemX product range, the RC train that does not require connectors and the constantly updated toy range, the challenge of the increasing creative demands of the 3 to 10 year old sector are met, eliminating the boredom factor. Playmobil is now on the Internet and you will soon be able to use the system with a computer: with



tions and details. This is also the link for the long-standing cooperation between Geobra Brandstätter and ARBURG.

This top quality mass production of small injection-moulded parts is ARBURG's domain. Since manufacture of the Playmobil started, both companies have been working together. Today as in the past, only top quality plastics are used, which meet the high requirements for stability, functionality and hygiene. The materials are neutral and do not produce any harmful emissions, they are perspiration proof and orally safe, and meet all the required guidelines, such as those in food legislation.

Collaboration above and beyond machinery

Right from the outset collaboration between Brandstätter and ARBURG went beyond just the supply of machine technology. Support in applications was increasingly required to coordinate ALLROUNDER machines, peripherals and tools.

This is why not only the Dietenhofen works in Germany have ARBURG machines, but also those in Spain and Argentina and Malta. Playmobil is also produced under licence in England, Greece, Korea and Mexico on ALLROUNDER machines.

The machine range used by Geobra Brandstätter now includes ALLROUNDERS with the latest high performance SELOGICA control system. As Karl-Heinz Jedamzik, the Playmobil Technical Manager, says, "Without exaggeration, we can say that ARBURG has set an example for injection moulding machine manufacturers in terms of service, the supply of spare parts, training, customer support, etc.". And the latest generation of ARBURG machines, the ALLROUNDER S range, also finds favour with Jedamzik:

CD ROMs children can enter the virtual Playmobil world.

An outstanding system

This educational toy has received official recognition and praise both nationally and worldwide over the years. Since 1974, some 1.4 billion figures have been produced. If these were put end to end, they would reach nearly twice round the Earth.

Playmobil dream toys are made of plastic – but why? Because this is the only material that lends itself to such a wide range of func-

"The latest generation of ALLROUNDER machine technology is a complete, well thought-out and functional system solution, from injection moulding of plastic parts to stripping and selection".

According to the technical manager, the SELOGICA sells itself with its easy overview of process parameters and its functional design. Other plus factors are the excellent display of the cycle process and graphic representation with modern symbols. "Overall a user-friendly, ergonomic control system" is how Karl-Heinz Jedamzik summarises it.

Special machines to solve special tasks

The Playmobil production lines also include special machine technology for special tasks. The ALLROUNDER basic configuration is already very sophisticated and designed for automated injection moulded parts production. Removing of parts from the mould is handled either fully automatically direct or, for correspondingly larger parts, by mould-stripper robots.

A pallet system custom-designed for Playmobil requirements handles the finished parts. The blowing agent injection moulding system used as a special system also requires a specially cooled tempering process for mould cooling.

Automation for easier manufacture

The associated machine peripherals are supplemented by a central conveyor system with material separators on the machine concerned and colouring units for direct colouring of the master batch. The material is supplied from 17 silos each of 60 tonnes' capacity via pipework and drying stations to the machines.



Apart from the machine fleet, it is the production of the requisite injection moulds that constantly requires new investment, running into 2-figure million DM. The figures for 1997 highlight this: for the production of new models and the replacement of worn moulds, 419 (!) new injection moulds were required just for that year alone. Brandstätter has about 65% of these moulds made by companies in its own group, Brandform in Zirndorf and Inmold in Malta, including a large number of complex multi-component moulds.

Meeting future challenges will be child's play

Just over 70% of Playmobil production is handled in Germany. In order to meet a market with increasing demand, Geobra Brandstätter is relying on sensible

rationalisation measures. This includes optimisation of production processes, reducing throughput times and improving the group's work by increased individual responsibility.

Constructional measures are also proposed. In Spring 1998, the extended, upgraded injection moulding plant in Dietenhofen was incorporated in the production process. A total of 65 of the latest generation of injection moulding machines were installed at this works. The injection moulding plant thus now has 172 microprocessor-controlled machines and thereby is the most modern in Europe.

In 1998, total investments amounted to 34 million DM. After 38 million in the previous year, investment plans remain at a high level to ensure the company's future.

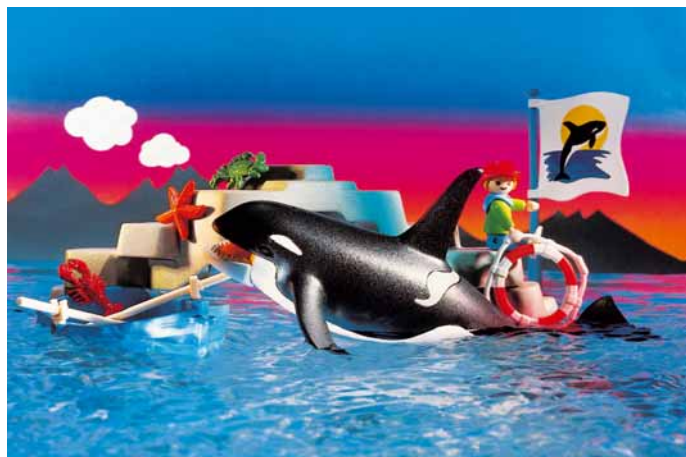
Small ideas with a big impact

If you are going to deal with toys, you also need to see how it works. So anyone visiting Zirndorf should not miss out on a couple of hours in the «Playmobil Fun Park». 1000 m² are devoted to making children's dreams come true – and, as we said, not just for children. The limits of this "play system" have already been exceeded with visitors from many areas in the holidays. As Horst Brandstätter knows all too well that his best customers – children – need to be spoiled and their enthusiasm won, an extension to the park is already under way. An attractive outdoor play area is planned, with adventure golf and lots of interior changes. The entire complex is scheduled to re-open in summer 1999, remaining true to the style of Playmobil's 25th birthday.

ARBURG is also involved in the success of Geobra-Brandstätter and thus the success of Playmobil. In November 1998 a further four ALLROUNDER S machines were delivered to the company, and these are already in operation in the injection moulding works.

"Innovations for Playmobil are of course also planned for our Jubilee year in 1999", Karl-Heinz Jedamzik informs us.

"But it is too soon to talk about this yet – it will have to be a surprise. Suffice to say that ARBURG's ALLROUNDER machines will be used for these."



playmobil

An information source for injection moulding

An integrated team with decades of experience and sound knowhow. A synonym for fast, efficient problem solving, plus constant improvements.

Only professionals deserve this description. And at ARBURG the emphasis is on optimum use of all ARBURG products by customers, right from the outset. What we are talking about is ARBURG applications technology, or AT. In terms of hierarchy, this comes under the company management sector of marketing, also providing sales support.

As is logical, employees largely focus on measures to ensure that production runs smoothly from the outset at the customer's premises.

Applications technology as a sales support department entails bringing the specialists working there and their knowledge together with the customers and their requirements. The result is a lively exchange between both groups, and close contact with customers.

AT operates separately in four task-related sub-groups: applications technology, injection moulding, machine acceptance and applications advice. In view of the different requirements these groups specialise either in specific customer requirements or markets in which ARBURG is active.

Engineering department and demonstration hall

The engineering department, which is also attached to the demonstration hall at the head offices in Loßburg, has two tasks, namely one external or customer-

related function and a second internal function. Direct customer support is provided by practical tests in-house or at the customer's premises. Test injection moulding can be carried out in the demonstration hall with test moulds for customers, who can also participate and check and optimise any components as necessary for suitability with the engineers concerned.

The engineering department also works on optimising method and process-related measures in the machine tool and materials sectors. How can new material mixes or compressed cycle stages be used to increase efficiency in the various injection moulding tasks? – this is all part of its day to day work.

In addition the group develops solutions for new injection moulding techniques and forward-looking technologies, in conjunction with the AT designers. Finally, engineering department personnel train customers in commissioning and give them instruction on new complex control and handling technologies.

This department also handles "operational requirements". The demonstration hall produces injection moulded parts that are used to make ALLROUNDER machines and ARBURG peripherals. Also, internal training programmes are given, and it is not just customers who are grateful for useful tips regarding machine technology and handling.

The demonstration hall lives up to its name. The latest generation of ARBURG machines is installed here. It provides a golden opportunity for potential customers to try out in practical operation ideas that will later

make their production easier. Special configurations with dedicated peripherals can be seen in action to give an exact practical picture of how production will work for them.

Machine acceptance

This group is closely linked to the engineering department, and is primarily concerned with customer-related acceptance of machines in Loßburg. Purchasing and optimisation of an ALLROUNDER machine are thus accompanied by specialist training, as in many cases it is not only a question of machines but also interaction with a new mould, for example, which need to be tried and tested first.

Advice

Customers can make the most of applications technology know-how right from the planning stage. This aid is particularly appreciated as it avoids unnecessary expense for cost-intensive sectors such as tool technology, mould design, machine layout, capacity calculations or handling techniques.

Here, applications such as processing two or three component, interval and sandwich injection moulding, insert/loading technology and silicon processing, are just some of the many areas in which ARBURG AT can give its customers the right advice.

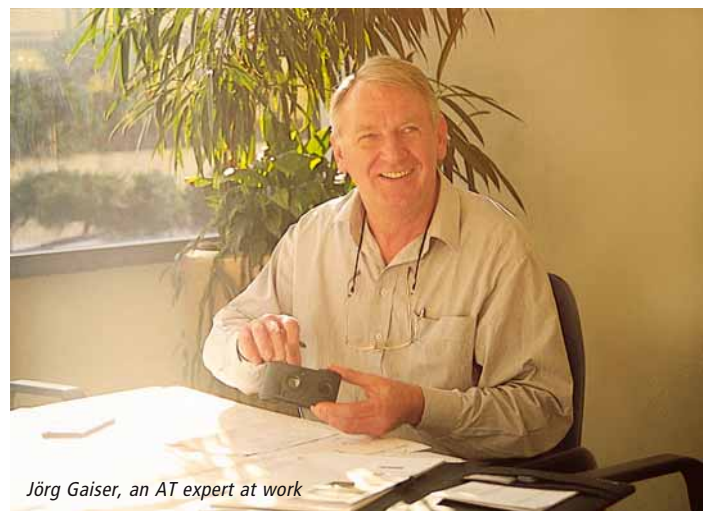
Cooperation ideally starts with the initial planning, and then continues through mould and injection part design through to commissioning of the entire installation designed to meet a particular application, as well as direct further technical help with the production process.

Development of applications technology

What now lies in the future will tomorrow be state of the art. And as ARBURG has promised in its company charter to constantly be a pioneer in technical innovation, it is only logical that applications technology should also play a role in development matters.

The AT development group, which in the hierarchy comes under the development department, is involved in identifying trends in the injection moulding market. Its staff develop and prepare new methods and techniques on this basis for practical application. Their brief also includes constant improvement of existing applications and technological machine equipment, however. The applications engineers thus ensure that the company, and consequently the customer, stays ahead in technology, which is essential to both of them to stay ahead of the competition.

(Continued on page 10)



Jörg Gaiser, an AT expert at work

International support

Experience, knowhow and practical support are not just available to ARBURG's German customers, but to those worldwide as well, wherever it is required. This is the responsibility of the "International Technical Support" team, a marketing department which also works in close contact with ARBURG Applications Technology. Support is thus quickly at hand in conjunction with trading partners and branches worldwide, whether it is for cartridge production in South America, sealing techniques in Africa, silicon applications in Japan or rubber processing in Scandinavia.

In the lead, at home and worldwide

To see just how good the service provided by the ARBURG Applications Technology and International Technical Support teams is, you have only to visit one of the many fairs attended by more than 40 experienced personnel from these departments.

Here you will always have time for a personal chat to quickly establish the crux of the matter and problem areas. Generally potential solutions can be offered even at this stage, as well as questions answered and concrete solutions sought. AT and ITS are thus ARBURG's sources for providing detailed knowledge about the injection moulding process.

So, how can we help you?



Comprehensive checks

With ISO certification, quality control down to the last detail, responsible personnel, and compliance with the most stringent quality specifications, ensuring the required production level has now become one of the key factors and an important criterion for companies to distinguish themselves from the competition.

But how does this work out in practical terms? Who works where and how to achieve overall quality in a company? ARBURG works every day towards reaching expectations in this area. To see how this works, we can look at an example that is representative of ARBURG's quality control efforts as one of the leading injection moulding machine manufacturers.

The component whose "quality background" we propose to look at in more detail in this report is a cast iron blank, which will later be used as a fixed tool plate in an ALLROUNDER C machine with 520 mm tie bar spacing. It will be evident from this part that appropriate quality control starts a long

way before its arrival at the gate of the works where this component will later be processed.

Series preparation

The first step in the manufacture of a perfect cast part is design discussions between the foundry, the mould manufacturer and ARBURG. Solidification simulations carried out by the foundry help to identify the optimum part design for the specified use. Initial testpieces are produced at the foundry, when optimisation of both the item and the casting method may take place.

Then an initial sample delivery of blanks will be approved for the foundry. Assessment of these parts is handled by ARBURG. The dimensional stability of the blank is then checked by measuring it with a 3D measuring instrument.



This is followed by ultrasound inspection, identification of possible material defects in the part and hardness tests, which determines whether the component will ensure smooth processing.

Finally, the processability of the part is checked by wear monitoring introduction as well. Points which need to be clarified in this are whether the structure (strength and toughness properties) will ensure good processability.

Continuous monitoring

Components checked in this way may be approved for mass production. But even then important details have to be constantly monitored in order to ensure overall quality. The foundry ensures uniform top quality production of blanks, for example, by cast analysis. For corrosion protection, delivery is made with special tarpaulins which also help to prevent damage in transit. On arrival, the cast blanks undergo a goods-inward check, recording any damage with photographs of samples. The components are then plastic-coated with the ARBURG mint-green colour.

In the processing centres, the parts are prepared individually for use, i.e. milled, drilled and thread-cut. Here the centres implement fully automated monitoring of the individual production stages based on programming specifications with simultaneous measurement. If set values and actual values differ beyond the permitted limits, the machines are readjusted by the "Renishaw correction" system.

The first part produced for an order is fully checked again on a 3D measuring machine for dimensional stability. Further samples taken during the course of processing ensure that production continues without defects.

Personnel self-test

A further essential monitoring aspect is the self-test for personnel which has been part of working life at ARBURG for several years now. This concept is based on the individual responsibility of personnel for the components they themselves produce. For this, the processed cast parts are checked again on site for compliance with the various specified tolerance values, as is the case with threads. This self-test ends with the application of a personal identification mark on the cast part before storage.

Problems can arise at any time. This does not, however, have the same effect on sorting. For the parts we have been discussing this generally means cavities, mould faults, surface defects such as a coarse structure or dents and structure problems, for example due to excessively hard, soft or badly processed cast parts.

This can be remedied by structure inspections by metallography, i.e. by producing "polished sections", and spectrum analysis to determine the chemical composition of the material.

Troubleshooting

The mechanism for handling complaints – again an important part of ARBURG's overall quality assurance – is just as clearly structured as controls and tests. The Purchasing and Quality Control departments in the company work in conjunction with the supplier on troubleshooting. This is not based on allocation of blame, but focuses on remedying critical points.

Complaints statistics enable a comparison to be made between individual suppliers and help ARBURG realise the aim stated in its charter of achieving the best possible quality in its day to day operations.

In point of fact, these wide-reaching efforts to ensure a high quality level in terms of both cost and time spent are by no means inconsiderable. But the same applies in this sector too: anything that can be avoided by preventive measures must by definition cost far less than repairing products and the company image after the event. This is why ARBURG will continue along this path in the future.



Hardness tests using the shearing pin method in production control



ARBURG leaves nothing to chance: ultrasound inspection to identify internal faults



Overall certification

As the internationally recognised code of practice, ISO certification shows the customer what quality standards the company applies to offer products and services to meet competition worldwide. At ARBURG, this does not only cover products and services, but also the environment. This is why the company has had DIN EN ISO 9001 certification since 1995 and also ISO 14001 certification since July 1998.

This creates synergy between the two systems, which can be used accordingly to ensure that the company can offer optimum services that are also environmentally friendly. Management ensures that specific company aims are pursued continuously in both areas. There is a common "ongoing improvement process",

with the involvement of all personnel and suppliers. Both ISO procedures also require written documentation of processes. ARBURG has developed its "Management manual for quality and the environment" to this end.

Internal audits enable a check to be made on whether actual practice reflects the theory. The ISO process is also a key factor for ARBURG in this respect; management looks into this matter at regular intervals, so that any deviations in set and actual values can be remedied promptly.

Finally, in addition to the internal audits, there are also external inspections, conducted by outside consultancy organisations. For combined certification, quality and environmental management are checked together.



Bottles made easy

The market for PET bottles is growing: from the 61 billion made in 1995, the number is likely to double to 123 billion by the year 2000.

It is soft drinks in particular that are primarily bottled in PET bottles (recyclable disposable or reusable bottles). Soft drinks and water are the front-runners. The advantages of PET packaging compared to glass bottles are self-evident; they offer the same standard of hygiene but are lighter and therefore easier and more profitable to transport. The manufacture of raw materials and bottles and recycling require less

energy, and plastic bottles are more stable than their glass counterparts. This was reason enough for ARBURG to launch into this market with an ALLROUNDER for making PET preforms.

A run on PET

In Germany, the PET bottle is gradually starting to appear. Coca Cola was one of the first manufacturers in the soft drinks sector to use PET bottles on a wide scale. The GDB (Genossenschaft Deutscher Brunnen) is conducting tests with PET reusable packaging. Soft drinks have been available for some time, and mineral water in PET bottles should soon

follow. Various major spring water suppliers such as Gerolsteiner have in the meantime developed their own PET reusable bottles and have already started marketing them.

Cosmetics, medicines, and beer

Due to the low cost of raw materials for polyethylene, a great deal of packaging has changed to PET. Examples of this can be found in the cosmetics and pharmaceuticals sectors in particular.

But breweries have also recently been discussing bottling beers in PET bottles. Individual tests are already being run. In order to be able to keep the beer long enough in plastic bottles, "barrier materials" can be added.

The ARBURG preform system

The areas of application for the ARBURG preform system primarily include the production of small runs in the soft drinks sector and for pharmaceuticals, medicines and cosmetics.

A vertical ALLROUNDER 420 C 1000-350 forms the basis for a specific application. To ensure optimum injection moulding results in the manufacture of preforms for PET bottles, this ALLROUNDER of special structural design offers the ideal solution. The vertical machine has a sealing unit operating top down, which is particularly suitable for automated solutions.

There is a 16-unit hot runner mould in the machine for the production of more than 92,000 tubes or bottles per day with a shot weight of 8.5 grams.

Production

The "electromechanical dosing" system design enables simultaneous tool mould movements, with dosage continuing until the next injection. During the opening process, the injection moulded parts remain on the mould core, i.e. on the top half of the mould. The removal plate moves horizontally into position in the mould, the stripper plate pushes the preform upwards from below from the core and presents it with positive interlocking on the removal plate.

After leaving the mould area, the injection unit advances and the new injection cycle starts. The preforms are then moved by a handling conveyor for further cooling either by air or water and then placed in a finished part container.

A convincing argument

In this configuration, the 16 notches are in the bottom part of the mould. This means that the cavities are filled from the bottom upwards, ensuring optimum parts quality. Vertical mould removal

by the stripper plate can proceed without deformation even at relatively high temperatures. Further cooling of the parts takes place outside the mould, which means shorter cycle times – about 4 shots/min in our example.

Stripping can be achieved relatively easily and thus more cost-effectively with the design of the installation. The footprint of the production unit can be reduced to the minimum. Electro-mechanical dosing not only means shorter cycle times, but also more cost-effective material processing with the same high dosage performance and energy savings.

Mould wear is minimised with the vertical arrangement. Sliding cores do not have to travel as far as with horizontal systems. This means that it is easier to change to higher threads.



How bottles are made from preforms

After manufacture, the preforms are fed to a blower machine. Here, infra-red radiant heaters heat up the preforms. The hot-profiled preforms are stretched in the blowing moulds by means of an axially orientated stretcher mandrel. Moulding of the bottles is completed by introducing compressed air into the cavity at up to 40 bar. This process gives the bottle or tube its final shape.

Complete ARBURG solution

With this vertical machine, ARBURG offers a complete specialist system including a stripping robot, preform injection moulding tool, drier and if required a cooling unit in one go. It goes without saying that we offer a specialist, comprehensive service from individual planning through to support during on-line production.



SELOGICA for multi-component machines

So you want to use different moulds on multi-component machines? Or different specialist processes, such as sandwich, interval or combination injection moulding on one machine? Or incorporate complex tool functions in the machine process and also still process inserts and finished parts?

You can do all of these without any problem with the SELOGICA control on our S and C series multi-component machines.

Forget the usual fixed programmes with specialist machines! You can program any complex machine cycles in the usual SELOGICA way, with an overview and an easy editing facility.

The core of the SELOGICA control is the process editor. With this, the machine cycle is programmed graphically with symbols. The flowchart is always easy to understand and offers a complete overview. With applications in the multi-component sector the machine cycle can often be highly complicated with several injection units and expensive mould technology.

The machine installer quickly loses his overview, with consequent errors or unfavourable process settings. Not so with SELOGICA! Each individual machine function is freely programmable within the machine process. The control system automati-

cally suggests an insert position determined by plausibility calculations. Simultaneous movements can be programmed as easily as serial movements. The control system identifies any missing machine functions for insertion at a suitable position.

Another outstanding feature of the SELOGICA control system is its high integration capability. For example, the ARBURG 3 axis NC controlled system can be incorporated completely in the control environment and programmed with the same operating system.

Independently of and simultaneously with the injection moulding cycle, the SELOGICA can control downstream peripherals such as stamping or assembly devices. These units are started independently by an optional machine function.

Multi-component machines are frequently set up for highly specialised injection moulding tools. The cycle is determined by the manufacturer in a fixed program. This means that only a few tools can produce on a machine, and for changes in the cycle the machine manufacturer has to modify the fixed program at great cost.

With the introduction of the SELOGICA control system, this is now a thing of the past. Virtually all the usual market requirements can be programmed directly by the machine installer on site with the standard software. Fixed programs are no longer necessary. This not only saves time but also cuts costs. All machine settings including operating techniques are saved on floppy disk. This means that the use of different

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types of tool or different processes on one machine are no longer the exception but the rule.

With a rough definition of the machine cycle, this now has to be optimised. Major savings can be made in cycle time here too. There is no reason why different functions which were previously handled in serial form cannot be controlled in parallel. Core pullers started in serial mode can be programmed simultaneously as machine movements and started depending on the sequence.

In view of the often highly expensive injection moulding tools for multi-component processing, the monitoring possibilities of the control system are an important feature.

The SELOGICA system offers a wide range of freely programmable monitoring features for this. Mould position monitoring is an important aspect of this. Activation of processes in which the position of the mould needs to be monitored (e.g. mould open until intermediate stop) is handled simply by marking it in the production process. The mould position can be monitored as often as required during a cycle.

Another particularly important feature is flexible programming of monitoring, if for example core pullers are controlled simultaneously for other movements. Collisions in the mould obviously have to be avoided in this. The process can be monitored to check that core pullers operated for mould, ejector or injection movements have reached their end position before the reference axis has reached a previously determined path position.

If injection moulds with several cavities are used, deforming of all moulded parts must be ensured to prevent damage to the mould when resealed. Optimised monitoring with infra-red or photo-electric cell systems or visual monitoring by means of a camera can also be incorporated in the SELOGICA control system to handle this.

The SELOGICA control system proves its worth with the following features:

- Graphic cycle programming
- Overview of machine cycle in the form of a flowchart
- Freely programmable process handling
- Virtually all the usual market requirements can be met with the standard software
- Simple programming facility, especially of simultaneous operation of functions
- Simple editing in the current cycle, ensured by plausibility checks
- A wide range of monitoring options ensures perfect operation
- Special mould functions can be incorporated in the cycle by programmable inputs and outputs.
- Peripherals including operating techniques are fully integrated.

Team Allround: new working methods

The successful introduction of new models into the workplace can only be successful if there is something in it for everyone! This means more flexibility and motivation for the personnel involved and productivity and cost cutting for the company. The key word that brings them together is teamwork: after 2 years' practical experience, we can now report back.

As far back as Autumn 1995 it was decided to introduce special workshops on the subject of introducing teamwork at ARBURG. The project was named "Team Allround", as it was designed to increase efficiency and quality amongst other things by an all-out attack on employee qualification.

Before practical implementation of the project, there was a planning phase lasting several months, focusing on a general decision as to the suitability of the changes to replace the former production processes and structures efficiently.

Aims

Other important aims included reducing the machine throughput times by 20 percent, a further increase in production quality, a reduction in friction with other groups and departments in the company and individual responsibility for identifying and remedying weak points in production. The last point alone clearly shows that reinforcing the individual responsibility of each employee or his group is of central importance.

The line of approach soon became clear: training measures should improve the individual responsibility of each employee, thus improving quality and productivity and achieving better job identification through motivation.

So what does teamwork mean?

Teamwork is firstly characterised by clarifying the hierarchical structure. Members of the team are in fact on equal footing, and a team spokesman represents the views of the team to the team manager, who in turn is the contact with the departmental or sector manager.

In the event of problems within the team, internal mechanisms are used first to solve problems, instructed in training. Only if this way fails does the team spokesman in his role as moderator look to the team manager, in order to resolve the problem together with him and the team by discussion. If a satisfactory result cannot be achieved in this way, the matter can generally only be referred up the hierarchy. This solution has in practice been used very rarely indeed within ARBURG.

The flat hierarchy is also noticeable in the work distribution within the teams. In simple terms, each employee has to be able to master and carry out all the tasks within his team, in other words be an allrounder. This ensures that the overall work load can be completed as flexibly as possible. This factor is particularly important for situations of absence due to illness or leave.



production and electrical assembly. In the handling department it has involved restructuring of the entire department. At the beginning of the year, the materials management sector was also included in the teamwork scheme with 60 employees. This meant that an additional interface could be introduced for smooth handling of machine throughput in the new working system.

A democratic structure

Introduction of the new working model focused on the personnel and functional responsibilities in a team arrangement. Increased individual responsibility and more flexibility in organising working procedures, and thus division of free time and leave, were considered positive by all. Greater contact within and between teams meant that problem areas in the production process could be identified and remedied.

The high degree of flexibility of the new organisational structure means that working and free time can be arranged relatively independently within the team itself.

All the above factors together contribute to personnel developing a greater feeling of personal responsibility, which means greater motivation in the workplace.

Practical tests

After just over 2 years of intensive practical tests with the new working arrangement now extended to several teams, all those involved are satisfied. Collaboration between teams, team spokesmen, team managers and higher hierarchical levels has proceeded smoothly, achieving production and quality targets.

Training by external training staff has enabled personnel to assume responsibility for planning personnel and leave, working procedures and internal team discussions. In return, senior personnel

have willingly ceded their powers, thus giving more room for decision-making by the teams.

Pilot project with four teams

In the first stage, four teams were set up in the assembly sector, to obtain practical experience in a pilot project on teamwork. Assessment of the results would then form the basis for a decision for or against teamwork. Personnel in these teams were not only trained, however. Visits were made to other firms already operating a teamwork scheme, and these served to illustrate to the team members the specific advantages and problems associated with the new working method.

In November 1998, an initial report from the team leaders was presented, and this proved very positive. The introduction of teamwork was accompanied by parallel changes in planning and selective machine approval, implemented retrospectively. Employees also expressed their satis-

faction with the results, which again served to reinforce the teamwork concept. Individual responsibility and motivation were greatly increased, improving interdepartmental understanding and appreciation of problems by greater communication between teams.

The commercial targets sought were achieved, and production quality improved further still. This made it clear that teamwork should not only remain a fixed element of ARBURG's company policy, but should be extended to other areas of the company.

In the interim this working model has been introduced in all the assembly sectors, electrical

Motivation of personnel finally has been improved by the fact that success in production with the new working method is measurable.

Great satisfaction

There is satisfaction in all areas with what has been achieved so far. The emphasis here is on "so far", as further steps towards teamwork are planned for the future. In areas of the company where this tool can be used to improve efficiency and motivation, ARBURG will introduce it. Innovation does not only mean creating new products but also looking to achieve optimum efficiency and the best working environment in internal procedures.



A bridge to Eastern Europe



At the beginning of the Nineties, Poland was, as you might say, a test case for ARBURG's first steps into the Eastern European "target markets".

The company is now represented in Poland, the Czech Republic and Hungary with its own branches. Target markets are countries in central eastern Europe, even if those keen on their development have presumed an easier time with introduction. At ARBURG, the approach has been quite realistic. Our commitment to Eastern Europe is seen strategically as medium to long-term measures. Planning is thus based not on quick gains but a solid, partnership-based business arrangement.

The branch in Poland was set up back in 1992. It is located in Michalowice near Warsaw about 15 km from the international airport. The aim was to take a positive approach from the outset to the continuing economic development forecast for the coming years and contribute to the local market. As things stand at present, expectations have been met with regard to increased demand for high quality investment goods. The used machine market which offered very favourable prices at the outset has gradually fallen - largely due to improved financing facilities- in favour of new machines.

Most Polish customers are still very price-aware. Almost 70% of ARBURG customers in Poland are first-time buyers, but favourable terms of payment or alternative forms of financing are quite often part of the sales negotiations.

Securing attractive long-term market shares

Due to ARBURG's long-term commitment in Poland, the company has been able to secure an attractive market share with its efforts. The major part of our clientele comes from the packaging and electrical industries. Gradually, however, we are starting to see major international automotive companies who are trying to become established in Poland, especially the German and Japanese, asking increasingly for injection moulding machines.

As with all our other branches worldwide, ARBURG Polska sees itself as a partner of plastics processors, whom we can offer

- continuing technical and applications advice
- training for operators and engineers
- fast spare parts resupplies from a company warehouse
- qualified service support
- machine demonstrations in a local showroom
- mould tests directly on site.

Constant expansion

What started in 1992 with 1 (!) employee, is now a complete branch structure by ARBURG standards with eight employees. Management of the branch lies in the capable hands of Dr. Slawomir Sniady.

After the recent extensions, the building has an area of some 250 m². In addition to offices there is a showroom with space for up to three ALLROUNDER machines and an excellent organised spare parts store to provide a swift service in the event of any problems.

This means that our Polish branch is equipped as well and is as flexible as all our others worldwide. This is in line with the ARBURG philosophy, to offer not only top quality machine technology in all the main regions but also provide services for these.



Polska