Information concerning
injection moulding
technology and market news

ARBURG today

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75 years of the Hehl company

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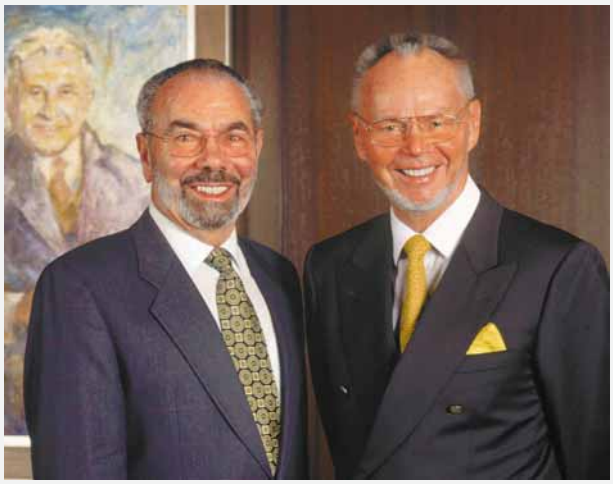


1998 is a very special year for ARBURG. We are celebrating 75 years of the continued existence of the Hehl family firm. 75 years of the Hehl family firm means 75 years of expanding and innovative production in Lossburg: from our point of view, an excellent reason for celebration. In 1998, a year which is further enhanced by the K Trade Fair in Düsseldorf, we intend to hold fitting celebrations.

And we have had a really special idea to accompany these celebrations. As our Jubilee gift to you, we present in this issue a complete new engineering series: the ALLROUNDER C JUBILEE. This combines the tried and tested engineering technology of the C series with the modern control theories of SELOGICA control. We are convinced that this represents a wide ranging machinery generation for the industry.

Our Jubilee confirms us in all our most important areas of activity. To transform a family operation into a company which is active world-wide within just 50 years, a company which can hold its own within the sector against strong competition from large multi-national corporations, with its own special blend of business concepts, shows clearly that, at the decisive parting of the ways, we have chosen the right path.

We remain, as we always have been, an internationally independent, innovative company in a leading market position, producing products of the highest quality which fulfil customer needs. The enthusiasm of those who work for us is transmitted to our customers and our partners. Our company concept is summarised in our company motto: ARBURG – Allrounders for economic efficiency in injection moulding.

On the basis of our experience, we are confident that we can continue to ensure ARBURG's extraordinary success in the future.

We hope that you will find the new issue of ARBURG today informative and enjoyable.


Eugen Hehl


Karl Hehl

A great beginning to a great jubilee

Even in its Jubilee celebrations, ARBURG is setting standards: the official opening of the Jubilee year for the 75 years continuing existence of the Hehl family company will remain an unforgettable experience for the invited guests, for several reasons.

On the one hand there was a celebration of a Jubilee, which was undoubtedly an outstanding event for the sector, and on the other hand there was a surprise revelation to the audience of a long-guarded secret. In a grand unveiling ceremony, underpinned with music and lighting effects, the ARBURG management presented to the public a complete new machine series: the ALLROUNDER C JUBILEE. The presentation of the entire series at once, showing the whole range from low clamping force machines up to the large machines, was something quite new and was much admired.

And this surprise effect was a success not only in Lossburg: on all five continents, the official start to the Jubilee year was marked with a special Jubilee event at all ARBURG locations, and also with some of our trading partners, within the various global time zones.

Celebrations were held in Japan, Hong Kong, Singapore, (jointly with Thailand and Indonesia), Malaysia, the USA, Poland, Denmark, Belgium, the Netherlands, Turkey, the Czech Republic, Switzerland, Spain, Italy, France, the UK, Austria, Sweden, Brazil, Mexico, Israel, Australia, Korea and South Africa. In Lossburg, many ideas had been put forward to present our VIP public with a truly memorable day.

Enthusiastic audience

Sales Manager Heinrich Fritz, with professional authority, presided over a packed (in the truest sense of the word) two-hour official programme.

"I have never seen anything like today in our sector, but with ARBURG you have to be prepared for anything," commented one of those present, who has had many years experience of the sector, taking evident pleasure in the extent of the celebrations and the flawlessness and "surprise" quality of the event.

A happy mixture

Much value has been placed on the harmonious variety of the programme. Historical resumés in the form of speeches alternated in a smoothly running sequence with multimedia presentations showing ARBURG's historical achievements and developments and also the innovative position held by the company today.

After a speech of welcome by Managing Director Heinrich Fritz, which dwelt on the historical milestones of ARBURG's development and parallel events in world history, the Chairman of the Board of Management Eugen Hehl gave his view of the history of the company: "When our father, Arthur Hehl, began manufacturing surgical instruments in Lossburg in 1923, no-one could truly have foreseen that this bold entrepreneurial step would ever result in such success on a world-wide scale".

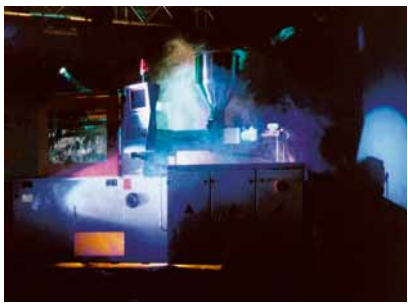
Thanks expressed for support

Although pleasure in this success is well justified, the hard work which went with that success should not be forgotten: "When we look back, on a day of jubilee celebrations like this one, there is much that may seem easy, almost too easy, like a game." During his speech, Eugen Hehl eloquently expressed his thanks to the wives of the Hehl family company, and also to the men and women employed by the company: the success of ARBURG was the success of a company family, and all had contributed to that success, whatever their position. Here he quoted the letter of good wishes sent by the Israeli trading partner: "ARBURG ALLROUNDERs strike a bridge from the past into the future". This motto could not have suited the tone of the event better.

Humorous anecdotes from Kurt Schaber

Following on from the great applause with which Eugen Hehl's speech was received, the programme moved towards another high point. With the former Sales Director for Germany, Kurt Schaber, who left at the end of 1996 to enjoy a well-earned retirement after 36 years of service to the company, ARBURG had secured a well calculated audience success at its Jubilee event.

Kurt Schaber, still very well known to all customers, led us through the decades with a series of anecdotes. The guests present enjoyed many stories which, on the one hand, demonstrated the best Swabian traditions of diligence in business matters of the ARBURG management, but at the same time also illuminated the ever present humane concept of "doing business" and "letting business be done".



The new series is revealed

And now the moment had come: ARBURG lifted the veil from the secret it had kept so well for so long. The ALLROUNDER C JUBILEE entered the stage. Following the unveiling, which set new standards in its ceremoniousness, the Managing Director of Manufacturing Herbert Kraibühler and Managing Director of Sales Heinrich Fritz held a short dialogue pointing out the technical and commercial advantages of the JUBILEE series.

With its highly interesting technical features, the JUBILEE edition from ARBURG possess' one advantage which can be seen at a glance: customers are being offered tried and tested machine components combined with an ultra-modern control technology – all in a JUBILEE package which is also highly interesting from the economic point of view.

The concept is modular, naturally

The modular design of the ALLROUNDER S finds its logical continuation in this series also. JUBILEE machines can be supplied with either SELOGICA or DIALOGICA user shell, with clamping forces of 300 to 2000 kN, four different injection units and tie bar distances between 270 x 270 and 520 x 520 mm.

Twice as good

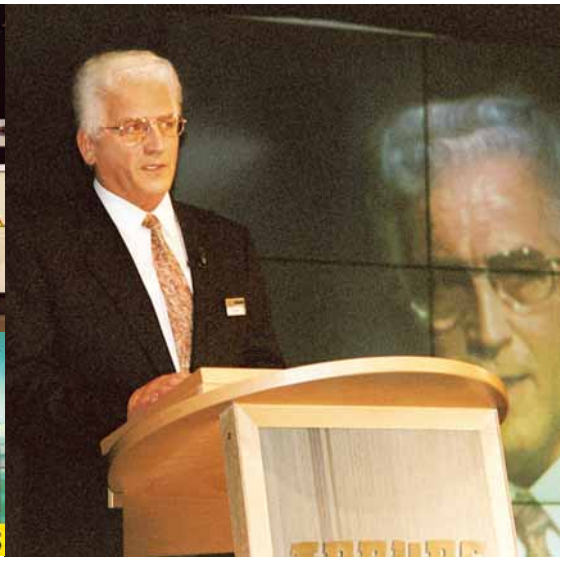
Using the graphic sequence programming of the SELOGICA user shell, machine operators can carry out even complex injection moulding tasks easily and quickly. Handling and peripheral equipment can (optionally) be integrated directly into the sequence programming.

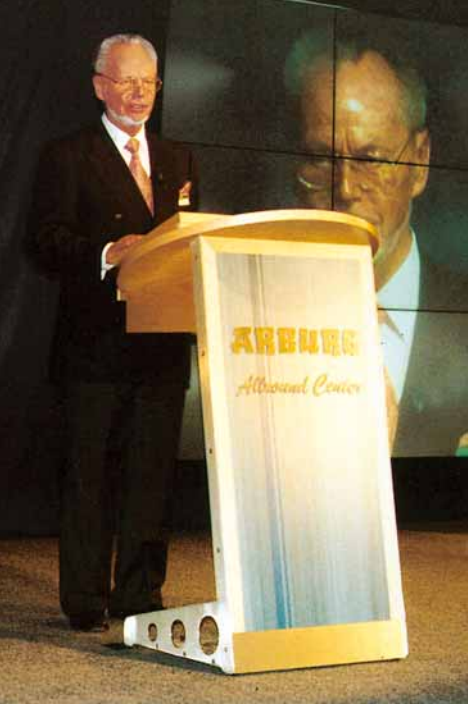
As an alternative to the graphic SELOGICA user shell, the JUBILEE customer can also order his ALLROUNDER with the known and proven DIALOGICA shell using selective menu logic. Standard for the DIALOGICA is the automatic validation control which effectively prevents faults in programming.

The best possible equipment

Four different injection units are available for the ALLROUNDER C JUBILEE. 270 and 320 C operate either with a 100 or a 250 unit, while the 370 to 520 C machines can also be supplied with the 350 or 675 units.

From the dialogue between the two Managing Directors, it was clear that many of the arguments in favour of the new series had originated in the Swabian "ideas factory". The audience evidently took the same view: there was lengthy applause in appreciation of those active in and responsible for this development, for an unforgettable experience in Lossburg, and congratulations for an extraordinary JUBILEE, followed by a remarkable buffet meal which provided ample opportunity for individual talks and exchange of information, and finally tours of the company premises.





Jubilee
March '98

New: ALLROUNDER C JUBILEE

Since 1923, practical solutions have been produced with expertise and precision in Lossburg, and these have since become known worldwide. Naturally our customers should also profit from the 75 year Jubilee of our company.

Another of these innovations, and indeed a very special one, was put on the market internationally at the same time as it was revealed with all due ceremony as part of our 75th birthday celebrations: the ALLROUNDER C JUBILEE series.

The already well known ALLROUNDER C technology has been combined with the latest SELOGICA control technology. The modular design has been retained as a logical consequence in this series also.

JUBILEE machines can be supplied with either SELOGICA or DIALOGICA user shell, with clamping forces from 300 up to 2000 kN, four different injection units and tie bar dimensions from 270 x 270 to 520 x 520 mm. The wide variety of standard equipment is completed with a series of options by which optimum solutions can be found for all requirements.

SELOGICA control: Everything central and to hand

With the graphic sequence programming of SELOGICA, the machine cycle can for the first time be put together using graphic symbols. The representation of the sequence appears as an easily understandable flow diagram which can be seen at a glance. Each step of the cycle can be quickly identified and directly modified where necessary, by calling up the parameter icons from the sequence programming.

Here, depending on the machine equipment, mould data and task data, and also the cycle sequence, only those adjustment figures are shown which are actually available. Expensive and time consuming programming is thus considerably reduced.

The automatic validation check gives protection from faulty programming. Comprehensive quality control functions, paired with optional graphic evaluations, permit quality control statements which are close to production.

Handling and peripheral equipment can (optionally) be directly integrated into the sequence programming, making the setting up of the ALLROUNDER C JUBILEE even simpler. Special sequences

75 years
of the Hehl company

no longer need to be separately programmed, but can be freely put together on the monitor owing to the flexibility of the control.

With the "window" display, the sequence programming and the parameter page selected via the appropriate symbol can be shown simultaneously on the divided screen. This makes programming easier by direct matching. Using the following extended functions:

- Production control (automatic switch on etc.),
- Extended monitoring (mould status etc.),
- Extended drive movements (ejectors etc.),
- Quality control (fault evaluation etc.),
- Optimisation / user help (freely programmable parameter pages etc.),
- Documentation (protocols and monitoring etc.)

the ALLROUNDER C JUBILEE can be precisely adapted to all injection moulding requirements.

DIALOGICA programming interface as alternative

As an alternative to the graphic SELOGICA user shell, the ALLROUNDER C JUBILEEs can also be supplied with the known DIALOGICA shell in selective menu logic. Here also, parameters which are not needed can be simply eliminated. The automatic validation check, which effectively prevents faults in programming, is also standard.

Various interfaces are available for controlling robotic handling equipment and peripherals for the DIALOGICA. In addition, up to 8 programmable inputs/outputs for cyclical connection of external equipment are possible.

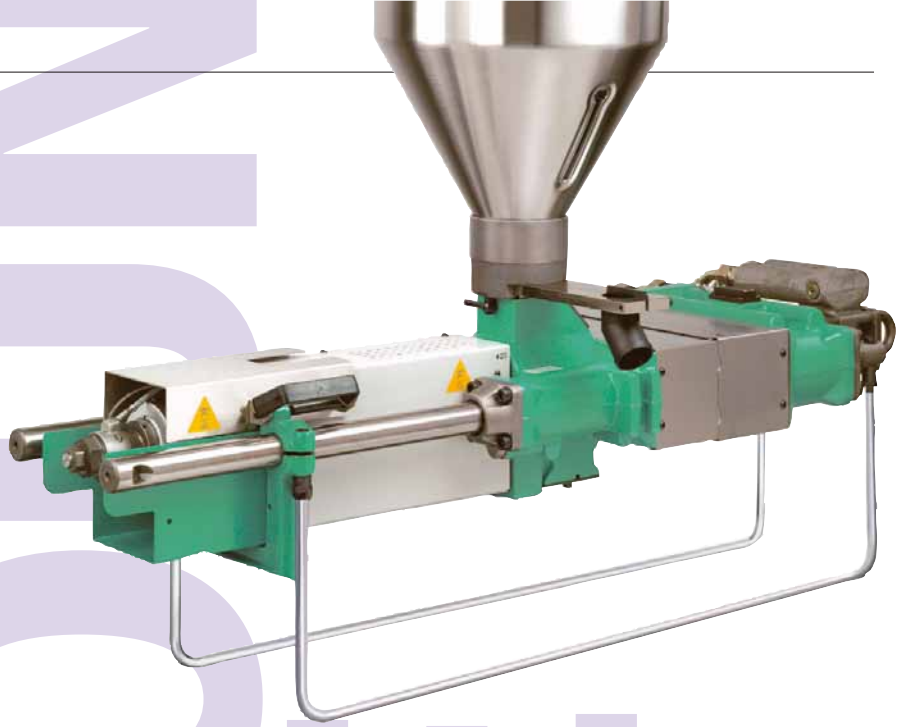
The DIALOGICA has the following extended functions to offer:

- Extended monitoring,
- Extended drive movements,
- Production control,
- Optimisation / user help,
- Quality control,
- Documentation,
- Operating data,
- Injection,
- Mould movements,
- Curve presentation.

The keyboard and monitor are located on a flat, swivable pendant immediately adjacent to the safety gate, which ensures an optimum overview in each operational phase. The design and colour of the new machines are based on the ALLROUNDER S series, which in future will provide the standard for the entire ARBURG range of machinery.

Stable machine base

The machine base for the Jubilee ALLROUNDER consists of welded steel frame. It carries not only the entire hydraulic system including oil tank and pumps, but also the electric motor and the equipment for regulating the temperature of the machine. The base and the hydraulic distribution manifold are set on vibration bearings, so that the machines are quieter and less subject to vibration. Oil temperature and control cabinet temperature are controlled by separate cooling circuits and the support yoke temperature is manually controlled as standard. An automatic control is also possible as an option. Up to 10 manually operable circuits are available to control the temperature of the mould. Automatic regulated control is optional here also.



High performance hydraulic system

The hydraulic requirements are controlled by two distribution manifolds. All valves are arranged on these units close to the slave units and are therefore easy to service. The injection regulator is standard. The clamping unit can be adapted to any preconditions by various hydraulic add-on stages, a distinction being made between the following variants:

– T1: The energy saving version with a regulating pump for serial, regulated machine movements with stroke-dependent, regulated end ramps.
– T2 regulated: Operates with two regulating pumps, mould clamping force is programmable and regulated, nozzle contact is programmable.
– T2 servo regulated: Equipment also with two regulating pumps. Additionally, servo valve closed loop to mould clamp for increased accuracy in drive movement and positioning, mould clamping force maintained by servo regulator via second pump.

With the hydraulic systems of stage T2, simultaneous drive movements can be carried out for faster cycle times.

Clamping unit: Precise opening and closing

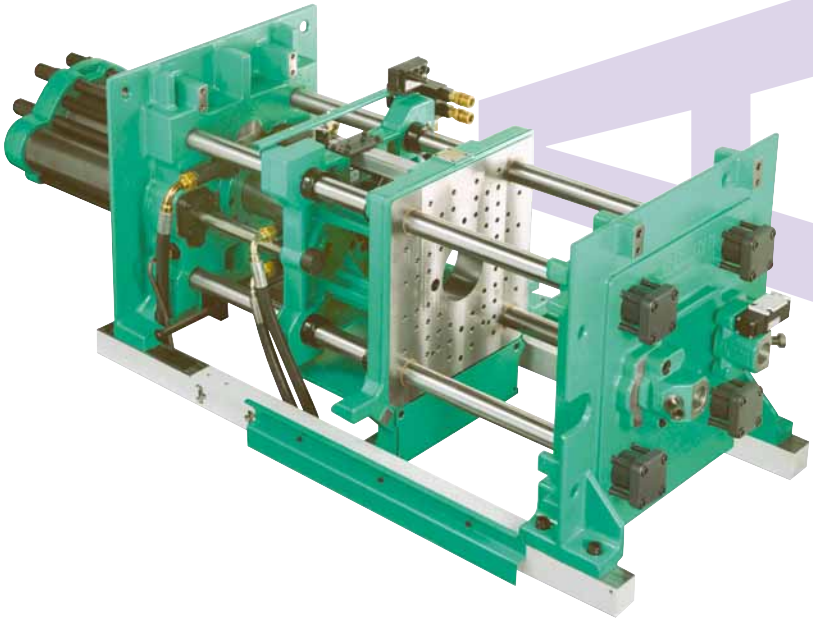
The robust design of the clamping unit ensures high precision drive movements. The separate drive cylinder system permits efficient oil exchange, which ensures highly accurate advance travel and optimum clamping. Both high travel speeds and slow travel under high force can be achieved without problems.

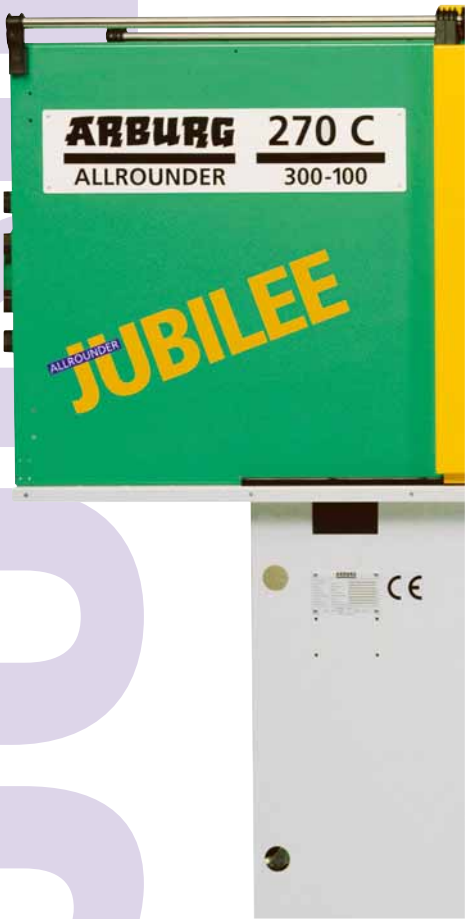
The clamping unit, guided by four tie bars, is further characterised by long bearing surfaces of the solid and stable box type construction of the moving platen. From the 370 C JUBILEE upwards, there are vertical supports on the moving clamping side, in order to ensure that the planes are absolutely parallel and that there is minimum form wear. The hydraulic ejector with rapid action closing is integrated in the clamping system and can be flexibly programmed via two ejector programmes. The rapid connect coupling simplifies the connection between ejector and mould.

ALLROUNDER C JUBILEEs can optionally be fitted with hydraulic core pulls, e.g. for pulling cores in the mould or for operating an unscrewing unit for thread demoulding. The connections with screw couplings are mounted directly on the moveable mounting platen.

Practical modular design: The injection unit

Four different injection units are available for ALLROUNDER C JUBILEEs. The 270 and 320 C operate either with a 100 or a 250 unit, and machines from 370 to 520 C can also be supplied with 350 or 675 units. The hydraulic assemblies with hydraulic screw drive, rapid action coupling, material hopper and cylinder are independent modules and are therefore convenient for robotic handling and cleaning. The cylinder module in turn consists of a heated plasticising cylinder, a plasticising screw and a nozzle.





The adjustable cylinder heating is programmed via the control unit. The regulating parameters are self-optimising and adapt to different control distances automatically.

The cylinder and injection control are standard, and the screw position regulator with controlled back pressure and nozzle contact force is the first option stage. The second optional additional stage available is the injection process control. By means of an internal pressure sensor acting in conjunction with the position-regulated screw, perfectly precise injection and dwell pressure characteristics can be achieved.

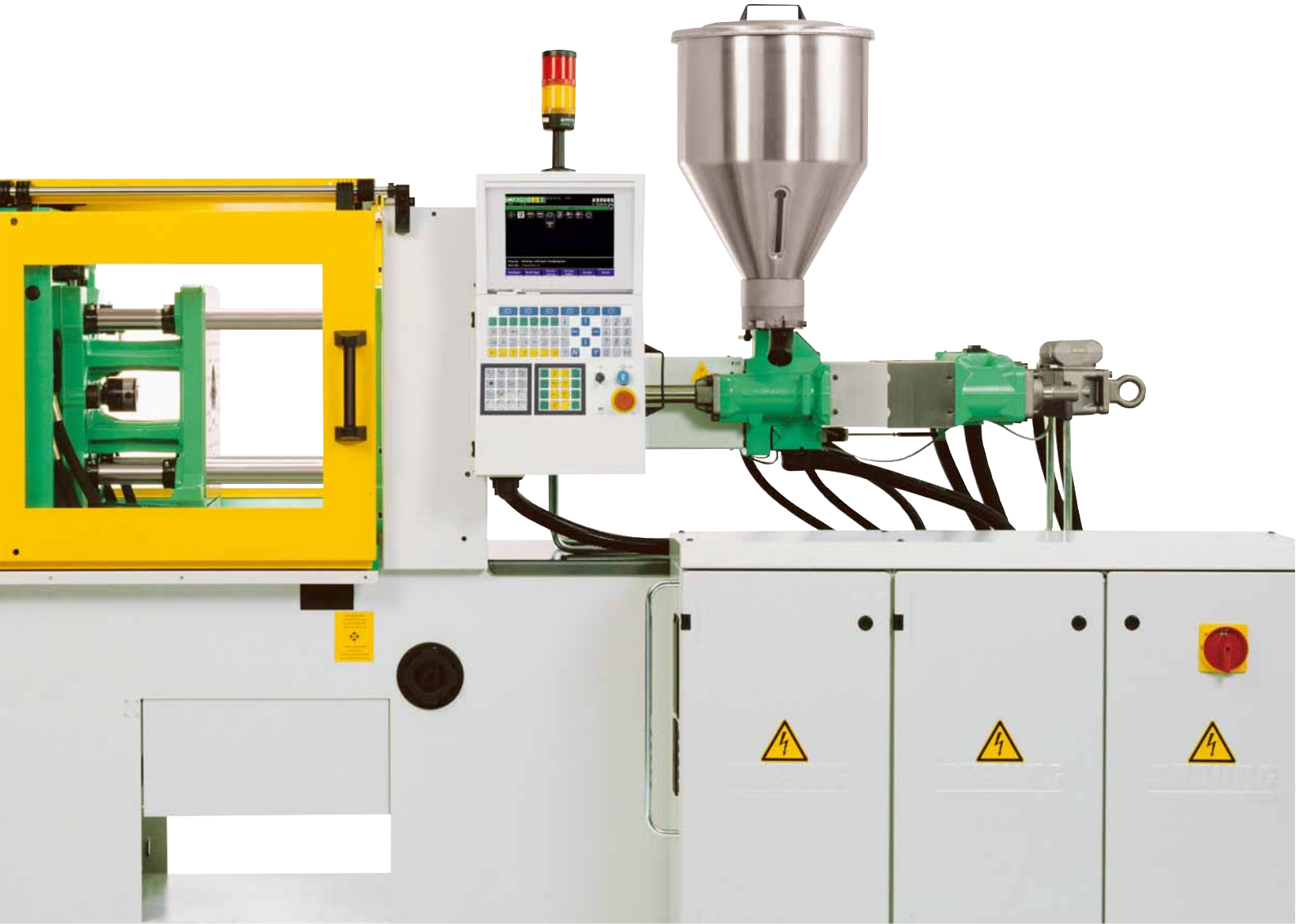
Each of the four injection units can be combined with three (and in the case of the 675 unit four) cylinder modules of varying diameter and three wear resistance grades for cylinder and screw. For special procedures (LSR, Duroplast, powder etc.) there are further modules in various sizes. The connection between the screw and the hydraulic drive of the cylinder is made by means of a rapid connect coupling with push-to-close action. All supply lines for the injection unit are created centrally via a plug-type connector on the cylinder module.

A parting line device for linear mould filling and VARIO version for horizontal free displacement of the injection unit (options) are further technical variants which add to the range of applications of ALLROUNDERs.

High technology for the Jubilee

The Jubilee ALLROUNDER ideally combines tried and tested state-of-the-art technical components with a new and innovative machine concept. With the modular construction, operators have all the freedom they need in programming, resetting, production and servicing, without having to sacrifice ergonomic considerations and simplicity in implementing operating requirements. The various practice-oriented grades of machine permit the customer to meet his specific day-to-day production requirements at the configuration stage of the ALLROUNDER, without having to exclude future application alternatives.

With the ALLROUNDER C JUBILEE, ARBURG has proved yet again that the most important feature of injection moulding machinery is practicality, and therefore flexibility. The name "ALLROUNDER" has stood for this principal feature of all ARBURG machines for many years, and this remains especially true for the "Jubilee edition" for our 75th birthday.



Two Jubilees - an effective co-operation

1998 is truly an extraordinary year for the German plastics industry, with ARBURG celebrating its 75 year Jubilee and one of its long term customers, the plug manufacturer fischerwerke having been in existence for 50 years. For decades the Tumlingen-based company has turned to ARBURG technology for its production of plugs, which are known the world over.

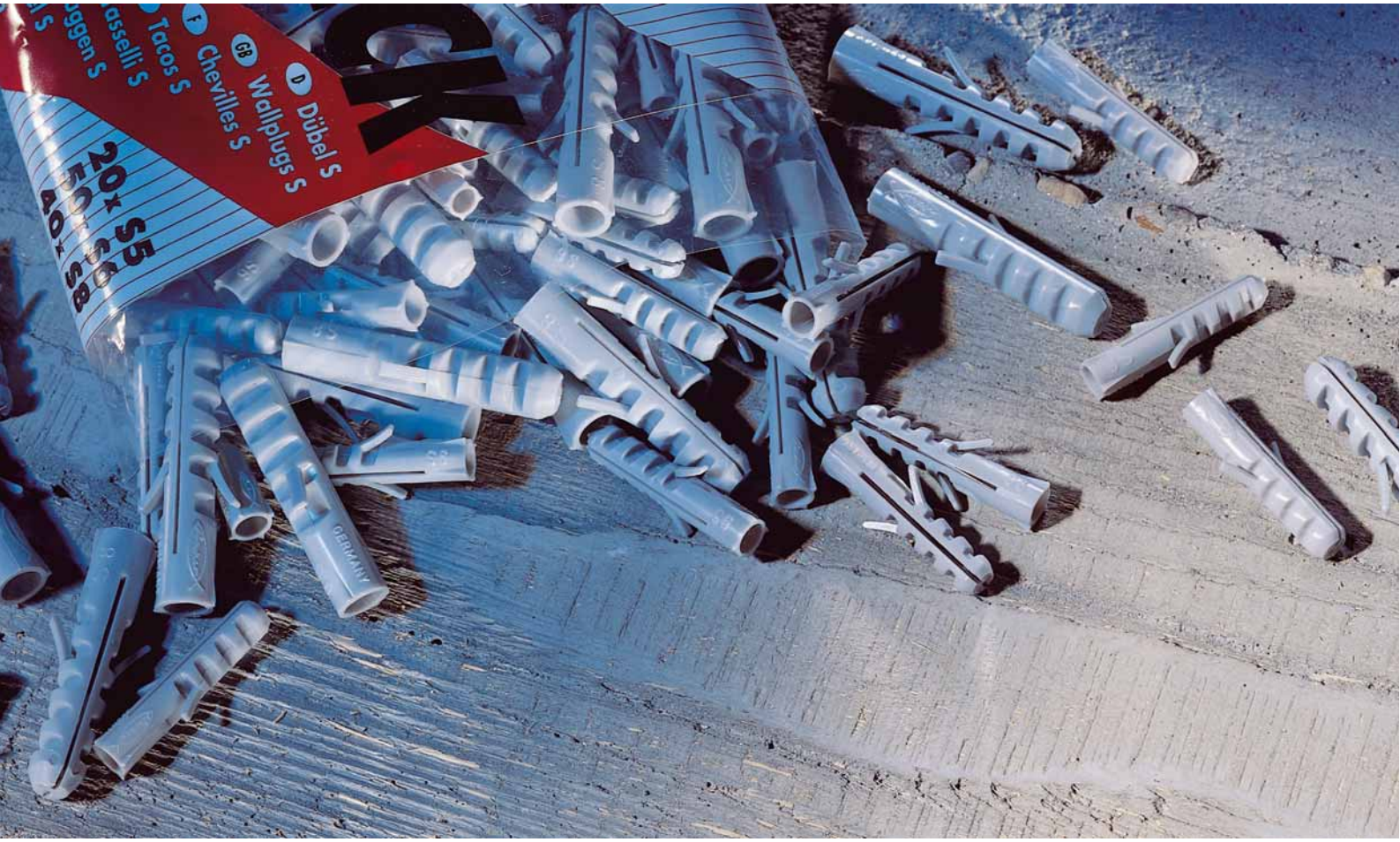
Thus the machine specialist and the plug manufacturer – both based in the northern Black Forest area – are connected by much more than good neighbourly relations: both are among the major employers of their home region, have a successful working co-operation and each have a long company tradition. In 1998, the ARBURG Jubilee year, fischer employees are celebrating the 50 years of their company's existence. There is certainly good reason to be proud of their company: the fischer group of companies has long been known as a supplier of brilliant ideas. fischer is "one of the most innovative medium sized companies in Germany", was the judgement in *manager magazin*, and Baden-Württemberg's Prime Minister Erwin Teufel can congratulate himself on having such "Swabian patent smiths" as ARBURG and fischerwerke based in his Federal Land.

Powerful indicators for the innovative force of fischerwerke, which today is valued by millions of home workers and craftsmen, are the number of individual inventions (more than 1600) and products which are known for their excellence world wide. And the managing partner Klaus Fischer already has the reputation of extending his innovative thought in the matter of products to the company as a whole. For the last 17 years the 47-year old son of the company's founder has been Chairman of the Board of Management.

Fixing systems (fischerdübel), technical construction systems (fischertechnik) and automotive systems (fischerCBOX) all originate from the same company, which today is a group of companies with more than 2,725 employees, DM 560 million consolidated annual turnover and 23 subsidiary companies from Brazil to China.

At the main site in Tumlingen, ARBURG's innovative engineering technology has long been greatly valued: plastics parts are produced here for the three main sectors of the business on 114 injection moulding machines. More than half of these machines are from ARBURG, including six dual component design machines. At present, in the plastics sector alone, ca. 6.5 million plugs are manufactured daily in Tumlingen.

Historical production site: at the plastics processing plant in Tumlingen, more than 6.5 million plugs are produced daily on 114 injection moulding machines.



50 years of the fischer company – a success story

The company was founded in 1948 by the 29-year-old Artur Fischer. As early as 1950 turnover had reached DM 164,000. Thirty years later, his son Klaus, also 29 at this time, took over the company with a total turnover of 160 million – and increased this turnover to 560 million in the financial year 1997.

This success has been based on fischer innovations: everyone in the fifties still used wooden blocks held together by plaster, or bushes filled with hemp, for screwing objects to walls; but for the last 40 years grey plastic has been the obvious choice: nylon plugs "made by fischer".

In 1953, when Artur Fischer was given the opportunity of taking over the manufacture of an English plastic plug in his home town of Tumlingen, he realised that this unassuming object would offer hitherto unsuspected solutions for fixing problems. He "had a feeling" that this was the right idea at the right time. However, after thorough testing, the trained metal worker was forced to realise that the British product would in practice only present further problems, and so he set about developing a plug himself.

In 1958 the grey *fischer fixing S*, made of nylon, was put on the market. There was much head shaking among building experts at the idea that this valuable plastic should simply disappear into the wall. But Artur Fischer, who likes to be known as "the man with 5500 patents", knew what he was doing: nylon is characterised by high chemical and thermal resistance, immense long term load bearing capacity, good resistance to ageing and neutral corrosion characteristics. The nylon plug thus offered, and continues to offer, the ideal prerequisites for long term secure fixing.

The highest production figures

Since then, more grey *fischer fixing S* plugs have been produced than any other type of plug in the world, and it is the most often copied! This tiny but immensely strong object has not only made day-to-day work in DIY and professional building easier, but has formed its own market in fixing technology. This is evident from over 860 fischer inventions in the field of fixing technology, a product range of over 1,000 types of plug and the highest number of building authority licences granted by the Deutsche Institut für Bautechnik (DIBt) in Berlin.

Internationally in demand

fischer has long been regarded as problem solver number 1 in all areas of fixing technology – plastic plugs, steel bolts, composite anchorings. At fischer's own research centre, top quality products are developed, from the new plug functioning principle (FUR) to the future-oriented service feature (the electronic catalogue).

fischer is also internationally in demand: whether in the Euro-tunnel or the Belt-Querung in Denmark, the London underground or the Amsterdam Arena, the Moscow Savings Bank or the Jin Mao building in Shanghai: fixing systems from Tumlingen are there.

Customer orientation allround

In recent years various customer surveys have been initiated in the injection moulding sector and also within ARBURG, to determine what the principal criteria are for deciding on the purchase of a machine.

The results of the survey brought to light some interesting facts: the first categories were all occupied with entries referring to after sales service. In other words, for the majority of customers the decisive factor when purchasing machines is not price, but customer service which is speedily available, spare parts which can be supplied promptly or an efficient telephone service.

ARBURG has known from an early stage that provision of high quality injection moulding technology alone is not sufficient to provide a comprehensive service to customers. For this reason, the company has been passing on its extensive expertise to customers for more than 25 years, by its presence on the market, efficient service provision and the detailed training programmes offered.

Optimum service: What this means to ARBURG

An effective service department cannot simply limit itself to offering support when technical problems arise with machines, but must indicate its competence to the customer before he has even bought an ALLROUNDER, by a variety of customer care services.

ARBURG has set up a network of such interconnected service sectors, consisting of:

- A telephone service
- Customer service
- Spare parts sales with high availability and short delivery times
- Advice on application aspects
- The Technical Centre
- Training.

Telephone service

With a telephone call, ARBURG's customers can often save themselves time consuming and costly visits from fitters. For these cases, ARBURG has set up its own telephone diagnosis service as the most important component of its service provision. This is operated in Germany by three service technicians in Lossburg and by all employees in customer service centres. Indeed, in ca. 70 % of cases, problems can be diagnosed and solved on the telephone.

However, if the problem cannot be clarified by telephone as expected, all service technicians can be reached by pagers or mobile phones, so that they can be on site with the customer as quickly as possible. The equipment of the customer service vehicles with over 5,000 spare parts also helps in the rapid removal of functional defects.

Internationally, the trained employees of the ARBURG branches are the first contact partners in "problem cases". Here also, a customer telephone service is available for the removal of any obstacles in the path of problem-free production.

Customer service: Effective help with problems

An effective customer service can be of decisive importance, since loss of production can be reduced by rapid removal of faults. ARBURG has therefore set up a world-wide co-operative customer service operation which ensures rapid help to customers experiencing technical difficulties. The model for this comprehensive service network is Germany with 17 service points and over 60 service technicians. In more than 80 % of cases, these specialists can be on site with the customer the same day.

From Lossburg, ALLROUNDERs are sent out all over the world. The proportion of exports is ca. 60 % of overall production. There are trading contacts with 110 countries. This high proportion of overseas trade requires an effective, flexible service network in addition to efficient machine design. 30 ARBURG sites in 20 countries ensure effective supplies to all ARBURG customers worldwide.

Spare parts service: Computer supported for fastest delivery times

In order to offer comprehensive customer service, it must also be possible for spare parts to be available in as short a time as possible.

In Lossburg, ARBURG has this direct access. It has a modern, computer controlled warehouse with ca. 35,000 replacement parts which, if they are available in the main store and are ordered before 4 pm, can be sent off on the same day. In urgent cases parts can reach the customer by 9 am on the following day.

In addition to the warehouses at the main site, all service points in Germany are equipped with a comprehensive stock of spare parts. In addition, Lossburg has a direct "on-line" connection with all European and US agencies. All stocks of spare parts, including spare parts for customer service vehicles, can be directly called up, in order to guarantee the shortest possible delivery time on an international level also.

Finally, via T-online, German customers can themselves ascertain whether a spare part for an ALLROUNDER is available, and what it costs. Orders can be placed at any time with a 3 % discount.

Comprehensive advice right from the start

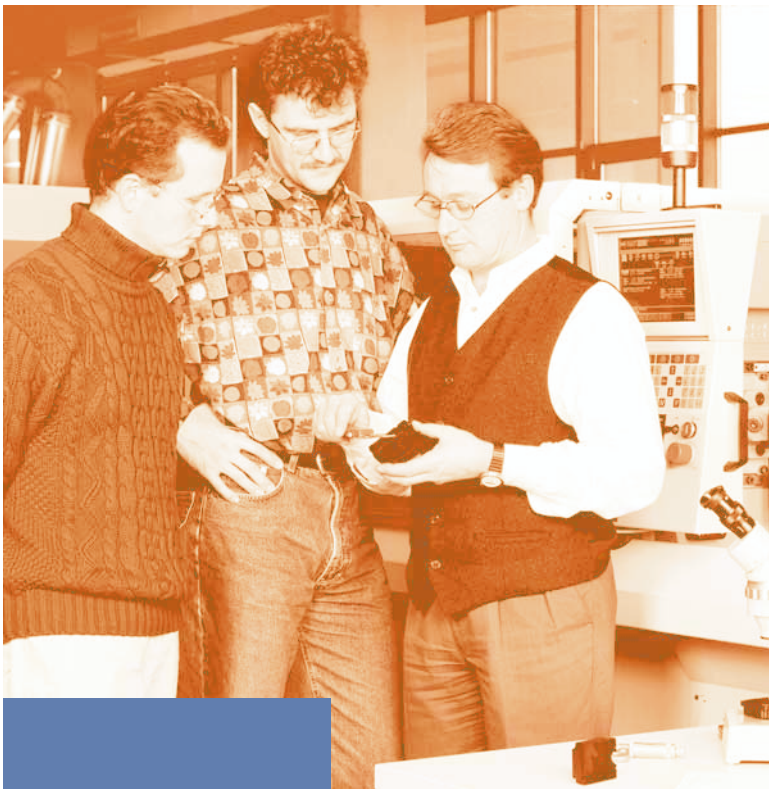
Right from the start, ARBURG offers its customers ongoing practical co-operation in order to reach well-founded and comprehensive solutions to all problems in injection moulding. Sales engineers and application engineers provide support with valuable hints and suggestions, e.g. regarding layout of parts, fill flow analyses, cycle times and also quality control.

From individual machines, through processing of special materials right up to planning and production of whole systems with ALLROUNDERs and peripherals (automation), the technical departments and systems technicians have a thorough knowledge. Experienced specialists address such matters as the setting up of the machines, the selection of control devices and materials suitable for the operating tasks in question, the form of the mould, the use of robotic handling devices and trial injections in the technical centres at Lossburg, Rednitzhembach, Radevormwald and in the ARBURG branches.

Training: The right basis

ARBURG offers more than 200 machine-based foundation courses, general courses and specialist courses annually. Approximately 60,000 participants have availed themselves of these courses over the last 30 years. Subdivided into plastics technology, machine installation, servicing and intensive practice courses, they can be used by participants to extend their basic knowledge of ALLROUNDER functions, choice of material and maintenance, and thus effectively improve the use and flexibility of their machines. The theories taught in the courses can be immediately put into practice by the participants on the appropriate machines, so that optimum machine handling skills are acquired. The extensive documentation written specifically for each course provides customers with the right answers to questions and problems.

In addition to the training sessions in the main site at Lossburg, technical staff also hold courses in Radevormwald, Rednitzhembach and St. Ingbert, so that participants do not have to make long journeys. Independently of the training courses in Germany, there are also seminars offered in all branches worldwide, held by local staff and specifically geared to the country in question.



Material and production planning: The basis for short delivery times and maximum quality

The ever-increasing quality requirements for the sector, the expansion of machine programming and the specialisation of ALLROUNDER technology have been provided by means of a system for production planning and material flow. The most up-to-date machinery is available on the market when required and in accordance with customer needs. Further considerations are minimum delivery times and a favourable cost structure.

Today the company has an efficient planning and material flow system at its disposal, one which cannot be bettered worldwide and which has a constant positive influence on ARBURG's productivity.

For the individual processing machines in parts manufacture, the capacity in use is determined from the order/deadline range of the production schedule. Depending on the urgency of the case, the processed parts are either sent directly for assembly or are kept in automated warehouses. This ensures maximum availability, particularly in the supply of spare parts. Naturally this affects prices in a way which is favourable to the customer.

ISO 9001: The right to expect quality

In order to make it clear, both nationally and internationally, what quality standards the company sets for itself and its products, ARBURG was certified for ISO 9001 as early as 1995. Within a period of two years, a relatively short period for a company of the size of ARBURG employing over 1600 people worldwide, the company was able to specify, establish and document the ISO requirement criteria for all departments in such a way that a positive overall assessment could be given.

The certification process was particularly time consuming not least because the production level in the company, at over 60 %, is relatively high. ARBURG was also tested for its ability to fulfil the ISO 9001 criteria. This standard covers not only production but also development, assembly and customer service.

The results are reflected not only in an optimisation of all company processes, but also in increasing motivation and identification of all employees for and with "their company". Comprehensive quality management has been achieved from delivery up to final assembly. The checking of dimensions, connections, interfaces and functions are of vital importance here. 100 % checks are always carried out where this is particularly important, above all for electronic machine components, so that for practical purposes defects in this area can be excluded.

On the other hand, the large number of items manufactured make it necessary in some areas to resort to random sample testing, for example in metal working. To check the complex processes which take place in metal-cutting production, in the turning shop and grinding shop, co-ordinate measuring machines are used, which provide three dimensional testing.

Material processing and testing are based on the same initial data. In the CADAM system used by ARBURG, the Development Department's CAD data are available both for NC programming via the software tool CAM-Kit and also for the measurement technique using GMP (graphic measurement programming).

All the approximately 10,000 different items of testing equipment of the company are regularly checked for accuracy by an external laboratory. ALLROUNDERs also are subjected to one final comprehensive check before they leave the factory. The checklist prescribes a lengthy machine run on the test bench to check functioning capacity.

All test processes carried out at ARBURG are documented. These reports clearly show test sequences, test equipment, target values, tolerances etc., so that the quality of the materials/parts used can be verified at any time.

In Lossburg, efforts are continually being made to improve service provision, so that the client is offered not only injection moulding technology optimally tailored to his needs, but also essential comprehensive servicing. The company philosophy shows this commitment, for "Quality allround" is the motto on which all activities of the company are based.

The Euro timetable:

May 1997: Start of ARBURG project group.

1st May 1998: Consultation of EU finance ministers regarding the list of participants in the third stage of economic and monetary union (EMU).

2nd May 1998: Decision of EU state and government heads regarding participants and members of the future European Central Bank.

1st January 1999: The Euro becomes the new legal currency of participating member states. At ARBURG and all European branches, invoices may also be sent out in Euros from this date.

31st December 2001: The DM will remain as house currency at ARBURG until the end of 2001 and the Euro will be nominally handled in-house as another foreign currency up to this date.

1st January 2002: By this date at the latest, Euro notes and coins should be in circulation.

EURO DM

Fit for the Euro

In the matter of the currency conversion from the Deutsche Mark to the Euro, ARBURG is in the forefront once again: according to Michael Grandt, the Managing Director of Finance, a project team has been working for some time to make ARBURG fit for the Euro.

The management want the company to convert to the new all-European currency as soon as possible. From January 1999, it will be possible for invoices at ARBURG and all affected branches to be made out in Euros also.

The introduction of the Euro has far reaching consequences for the economy and for consumers. In addition to important changes in the competitive situation, which will necessitate corresponding strategic realignments, the conversion will also have a tremendous effect on in-house processes and will necessitate carefully thought out reorganisation measures.

For a simple transfer of the company sectors affected from today's world to tomorrow's is not possible, either for ARBURG or for any other company. Far reaching changes in processes and structures are being undertaken to make ARBURG fit for the currency changeover.

Complex company areas such as accounting, EDP, contracts, insurance, purchasing, despatch and marketing are affected by the forthcoming changes, and for this reason a team of experts has been formed at ARBURG to undertake the work associated with the preparation, co-ordination and implementation of all restructuring measures to be introduced, both nationally and internationally. The team, formed around Michael Grandt, has developed the following basic points for a Euro strategy:

1. The DM will remain the house currency at ARBURG until the end of 2001, and the Euro will be nominally handled in-house as another foreign currency until this date. All existing in-house statistics will be drawn up on a DM basis until then. After that time, transactions in terms of value will be carried out only in Euros.

2. By the end of 2001 / beginning of 2002 all planning and calculation data and statistics must be capable of being converted into Euros "at the touch of a button".

"There will be no negative changes for our customers," stressed Michael Grandt. With the introduction of the Euro, the transparency of the individual European markets will be markedly increased as a result of the harmonisation of prices, and sales opportunities for German products will be decisively improved.

Until now, the European internal market has been decisively characterised by the many different currencies and the associated conversion obstacles. After the necessary EDP conversion procedures have been carried out (which, with ARBURG's far-sighted planning, will not cause any great problems) these conversion problems on the European market will disappear.

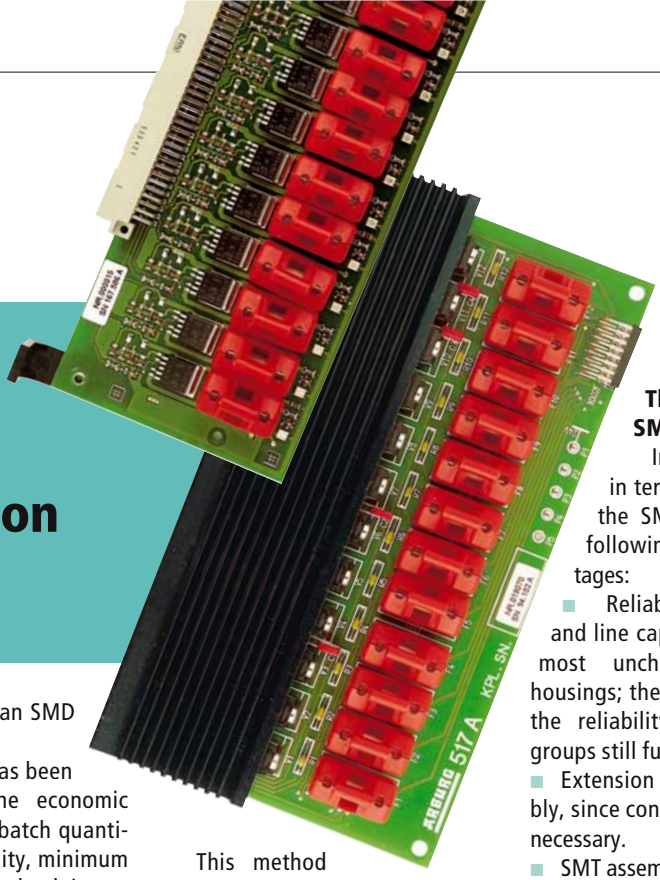
The German economy, with its very strong exports orientation, has in the past been particularly affected by exchange fluctuations "in sympathy", and this currency risk has inevitably had a negative effect on the German market and the investment mood.

ARBURG sees the conversion to the Euro, with all its problems, as an opportunity to bring further improvement to tried and tested procedures and to further increase the accuracy of planning and calculation. The whole process is, incidentally, extremely cost-intensive: finance expert Grandt estimates the costs required by the planning and organisation of the conversion at around DM 3 million.

"However, if we make no preparation for the introduction of the Euro, we risk far higher costs for conversion procedures which at that stage will be compulsory, and also possibly problems with regard to supplies and marketing, so that in the worst possible case entire markets could break away," was Michael Grandt's comment on ARBURG's far-sighted attitude.

SMD-

PCB assembly: Working on the surface



"Make or buy?" is a question which every company must ask itself today when considering the manufacture of components for new products. If a company decides in favour of in-house production, there must be clear advantages justifying the company's acquiring its own production equipment.

At ARBURG also, serious consideration has been given to the idea of having PCB assembly for ALLROUNDER machine controls provided from outside the company.

The reasons why the company finally decided to carry out this procedure as an "in-house" solution are clear: quality, flexibility and economy were the main arguments for acquiring an SMD insertion system.

The investment has been characterised by the economic production of small batch quantities of optimum quality, minimum set-up times and short lead times.

Other considerations which should not be underestimated were (and still are) access to new developments on the components market and support of developers through component manufacturers.

SMT: A definition

The abbreviations "SMD" and "SMT" stand for "Surface Mounted Device" and "Surface Mounted Technology". In this "surface mounting", the connecting wires do not have to be inserted through the soldering eyes of the PCB.

This method has proved itself above all because of the greater integration and connection density and the miniaturisation of the units. However, very much greater precision and therefore better quality of assembly groups can be achieved through SMT. In SMT, the components are simply placed on a PCB imprinted with solder paste. The components float in this solder paste, which consists of fine globules of diameter 30-50 µm, activators, resins and fluxes, until they are soldered in the reflow furnace.

The advantages of SMD technology

In addition to savings in terms of time and cost, the SMD process has the following additional advantages:

- Reliability; line resistance and line capacitance remain almost unchanged with SMT housings; the use of ICs increases the reliability of the assembly groups still further.
- Extension of automatic assembly, since connection wiring is not necessary.
- SMT assembly machines are significantly cheaper and at the same time more efficient.
- The boards can be up to 50 % smaller since SMDs are smaller.
- SMDs, being lighter, also minimise the mechanical load on boards and housings.
- The lack of connecting wires and holes for these wires in the board makes boards easier and cheaper to produce.
- Because of the reduction and shortening of conductor tracks, the boards are more compact and easier to reproduce.
- Mixed assembly with wired components occurs only with electro-mechanical components, but here also SMD-type plugs and relays are sometimes available.

Environmental protection with a system

There are some companies which, simply by virtue of their location in tourist and leisure regions, have automatically had a special sense of responsibility towards the environment "from the cradle". ARBURG is the best example of this type of responsible company. The 75- year history of the company is characterised by its efforts to keep the environmental effects of its production as few as possible.

Respect for nature as a basis for environmental protection

Production at the company, which is smoke-free, has provided from as early as the eighties an exemplary environmental concept which is in particular based on avoidance of waste and careful use of resources, but also on reusing used materials and environmentally friendly waste disposal methods.

The range of measures implemented extends from hiring cleaning cloths and work clothing on the production line and non-disposable towels in the company cloakrooms, to the environmentally friendly manufacture of complete ALLROUNDER components on production systems which do not waste resources, and the optimum use of energy.

New working methods bring advantages for the environment

By the use of plasma nitriding in the hardening process in the surface technology sector, the highly poisonous hardening salts which had to be disposed of as special waste at special sites are no longer produced. About four tons a year of these salts (mostly containing cyanide) are now no longer a burden on the environment as a result of the use of this new technology.

With the plasma nitriding system, environmental protection targets for the next few years are already being fulfilled. There is also an improvement – a double advantage – in the corrosion protection of treated parts as a result of using this system. Components can now be included in this treatment which have to be primarily protected against corrosion but should also be protected from wear, so that the range of parts in the nitriding furnaces has been considerably extended.

The heat released during the nitriding process in the furnaces is transferred via a cooling jacket to a water circuit. A heat pump draws this heat from the water and conveys it to the company heating system. In addition, ARBURG saves ca. 40 % in processing energy by a specific system optimisation measure, i.e. thermal insulation. The introduction of surface layer hardening for dosage screws, which has been in operation since the second half of 1997, has had a similar effect on process optimisation and, at the same time, brings environmental advantages.

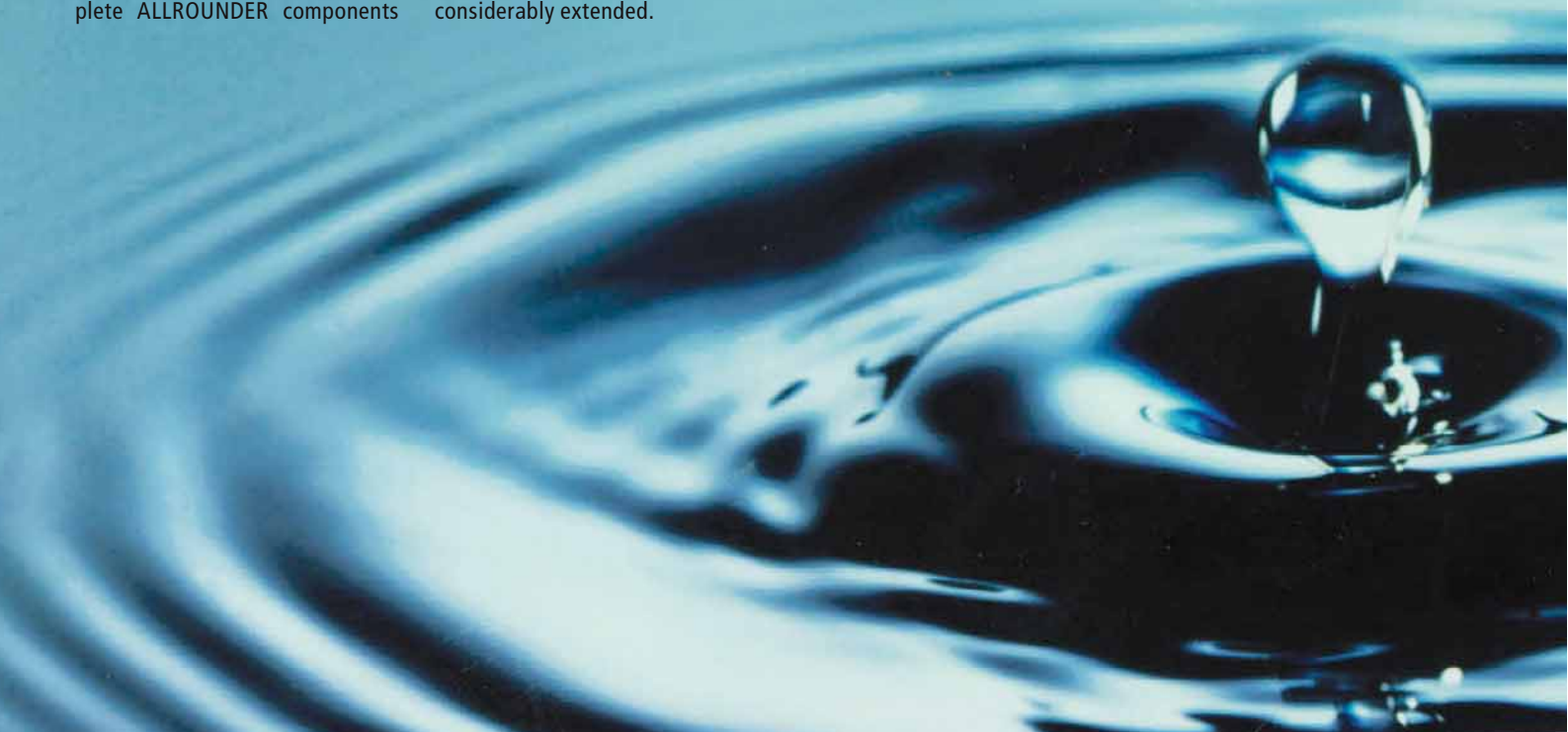
ARBURG was awarded the Eta certificate for introducing the plasma nitriding process. The Eta competition is organised by the Baden-Württemberg Association of Power Stations in association with Energie-Versorgung Schwaben AG in recognition of companies contributing to environmental protection by rationalising energy use.

Process control technology in ARBURG buildings makes effective use of available energy

As a logical consequence, measures to optimise capacity and total energy requirements in all sectors of the company are being implemented. Process control technology in the buildings of the company covers all production and administrative departments. Heat is recovered both via heat pumps (in the case of processing waste heat) and also by means of Econovent systems (ventilation systems), while speed-controlled drive systems make efficient use of further energy saving potential. A new bus-based lighting system controls the light situation in production rooms, depending on external and internal conditions. The variable light intensity uses resources without waste and thus further contributes to protection of the environment.

The new block-type thermal power station (BHKW) has, since the beginning of 1997, ensured not only optimum warm water provision for the cleaning baths, but also the supply of electricity into the company's own network (cf. also ARBURG today 7). The BHKW's electrical output of 290 kW is sufficient to meet the needs of 150 average households.

The air-conditioning for the multi-purpose building housing the company administration, and for the central EDP and various processing machines, is to be provided by these systems in the medium term. As part of the necessary replacement of cooling systems containing CFCs by the so-called absorption type refrigerating machines which operate on the principle of water evaporation, these measures should be successively concluded by 1999.



Coating instead of painting

For some years ARBURG has been using a plastics coating system for the surface treatment of many ALLROUNDER components. Only a small percentage of machine parts are still "wet" painted, and this has meant that there has been a considerable reduction in the resulting paint wastage as a problem material.

A large proportion of the mould machines in the metal working sector are already provided with cooling lubricants through central systems, in which the lubricants are subjected to intensive treatment by filtering, cooling and removal of unwanted oil by suction. Regular analyses make it possible for any changes in the cooling lubricant to be detected at an early stage. Service life of approximately two years can thus be achieved. A new central system is currently being brought into use, so that two older systems have been closed down.

Avoidance of waste is further aided by separation

A further central aspect of recycling within the company is separate plastics waste collection. In the in-house injection moulding operation, it is possible to collect waste plastic separately according to grade and colour and to send this waste plastic on for efficient recycling.

In the administrative departments of ARBURG, used paper and computer printouts are shredded and the resultant material used as packaging in the dispatch department, thus saving large quantities of wood shavings.

Special machines ensure that any polystyrene packaging is reduced to small chips and is returned to the dispatch circuit for use as packaging.

ARBURG's comprehensive policy of reusing materials and not wasting resources is thus convincing by virtue of its production methods, which produce little waste and are environmentally friendly, and also by virtue of the solutions adopted, which are sometimes unusual. The efforts being made by the company are illustrated by the projected certification of environmental management to ISO 14000, which is envisaged for the middle of 1998.

. . . . Notice board . . . . .

INFO The new *ARBURG Optical Disc Laboratory* has recently been opening its doors: with its modern equipment and expert service provided by ARBURG OD specialists, this institution will present an attractive introductory centre for interested parties and customers in future.

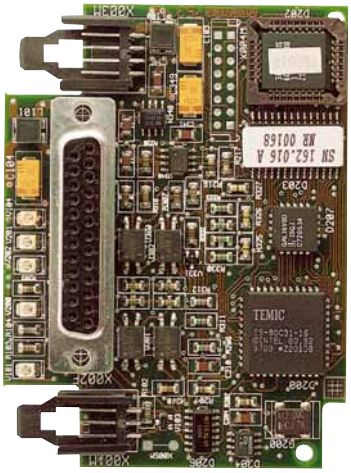
INFO On 26th March, in Madrid, ARBURG opened Spain's second *ARBURG Technology Centre (ATC)* in response to considerable customer interest in the Iberian peninsula.

INFO On 7th April 14 *trainees* celebrated the completion of their training. Again the results were excellent: 9 candidates achieved an overall grade of 2.0 or above and received a gift of books.

INFO Guests at the official Jubilee opening on 5th March were officially the first to be able to admire the luxurious newly refurbished *reception area* of the parent company at Lossburg.

INFO *Jürgen Schray* (41, photo) has been appointed the new head of ARBURG Application Technology, having previously been head of the ARBURG Technical Centre. He comes with a sound background for his future activities: after training and working as a toolmaker, he worked in ARBURG's design department. Following in-house training in application technology, he passed the examination in plastics skills in 1988 in Würzburg.

INFO *Antonio K. Schmidt* (33) is the new ARBURG Sales Manager for optical discs (OD). His very firmly based experience in the OD sector was gained in the course of various activities in the rapidly expanding market. After training as an electrician and a period as a service technician, he completed his Abitur and higher education in managerial economics, spending some time abroad in Brazil.



SMT at ARBURG

After five years of having these devices produced externally and being able to acquire some experience in this field, ARBURG has, since March 1997, had its own SMT-based PCB production assembly in addition to conventional board insertion with wave soldering equipment. In particular, the boards for the SELOGICA machine controls are produced here. In the choice of system components, it was quality and flexibility of the system rather than assembly capacity which were the deciding factors. The control electronics now consist of 90 % SMT assembled boards.

The SMT system is an in-line system consisting of a screen printer, an assembly machine and a reflow soldering unit. The assembly machine is the main component of the system, and this is designed for precision, universal use and set-up time optimisation rather than for maximum speed, as is the case with the system as a whole. The five feeders of the machine operate with different film thicknesses. The machine can take all rolls, so that assembly can take place in any order, since the feeder codes are read and recognised automatically. This minimises set-up times and makes the production of even small batch quantities economically viable.

The assembly section consists of two independent assembly heads each having five vacuum needles and an integrated adhesive dispensing head. In a sequence which is constantly being optimised, and which always guides the components along the shortest path, the assembly heads take the components out of the feeders with vacuum suction cups and place them in the solder paste in the correct position on the board. A checking station subsequently checks the boards for optimum transport position and fault-free assembly.

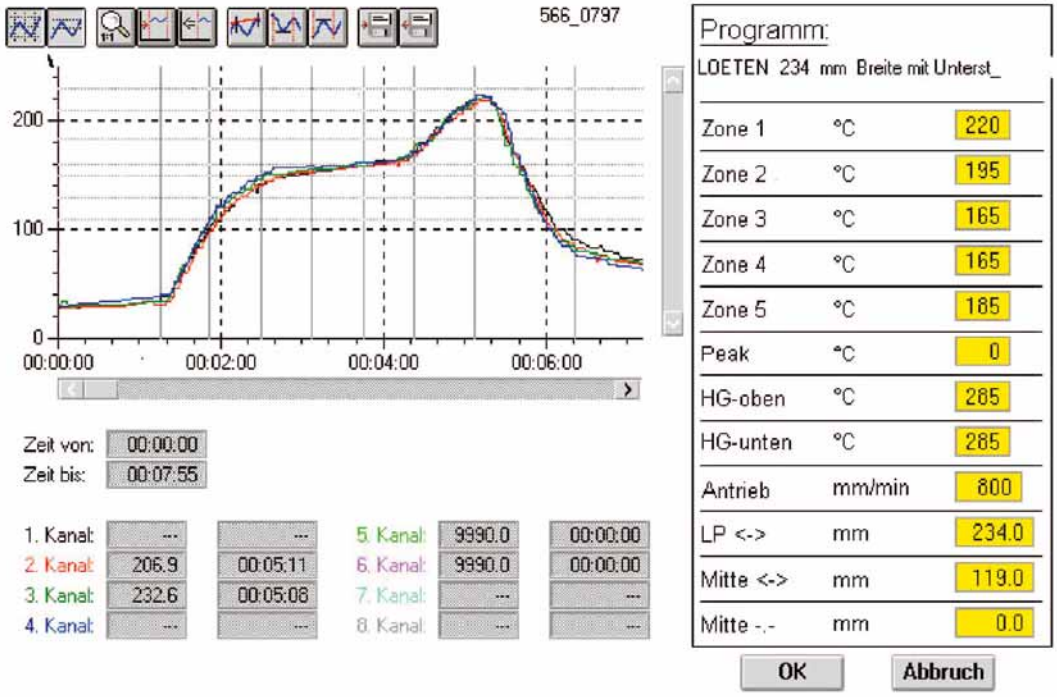
The assembled boards are then sent by conveyor to the reflow soldering system and soldered in a protective gas atmosphere. The protective gas atmosphere of the convection furnace ensures low oxidation levels and thus improved quality of connections, and consequently fewer failures, longer lasting boards and, ultimately, greater customer satisfaction. In comparison with the reflow systems used previously, which operated with radiant heat only, it is no longer necessary to adjust the solder profile.

The link up between ARBURG item numbers, roll bar codes, and feeder bar codes is carried out on the PC in the form of an item numbers-coding matching, which also provides an effective method of stock management for production planning.

Schedule expectations are fulfilled in practice

These words express in brief the positive experience gained so far by the company with SMD technology. High assembly group quality and assembly group reproducibility go hand in hand with allround flexibility, which means that even batch quantities of 1 can be achieved economically without any problems at all. Thus, for example, it was possible to run 0-series for development purposes under production conditions.

Not least, servicing and maintenance are made easier by the new technology. Progressive development with the emphasis on modular design has, together with the introduction of SMD technology, enabled the number of PCBs to be reduced. Simply by the positioning of a rotary switch, multiple use of a board in the SELOGICA can be achieved. Not only does this have positive effects on equipment and the provision of the spare parts service, but also engineers have fewer problems on site with customers as regards replacement/installation of SMT PCBs. Maximum flexibility with simultaneous use of rationalisation potential and simplified, high quality production: for ARBURG these are sufficient reasons for the decision to acquire its own SMD system.



HONG KONG: An important springboard on the route to China

An important centre for ARBURG's strong representation in the Asiatic Pacific area as a whole is the Hong Kong branch, formed in 1992. This branch provides service to the plastics industry in Hong Kong, Macao and the border regions of southern China.

Seven staff, together with the experienced ARBURG branch manager Sunny Poon, contribute to the great success of our branch in the former British crown colony, the sovereign functions of which were handed over to the People's Republic of China in accordance with contractual agreements in the course of last year. Two employees are responsible for sales and five more for maintenance and customer service. The branch has its own spare parts store which ensures efficient and rapid delivery of supplies to customers in the region. An interesting point is that, on the basis of production relocation, 50 % of all machines sold by the Hong Kong branch are already sold over the border to southern China.

The Asiatic region has, however, always been of special interest to ARBURG because of the strength of the local economy and growth rates. Even the current wide fluctuations in the economic situation do not in principle alter ARBURG's general long term attitude towards the region as a whole.

Before ARBURG set up its own branch in Hong Kong, its interests in the region were represented by the trading company Melchers, and ARBURG was thus able to continue its activities in Hong Kong after setting up the branch without losing any ground. Even at this early stage, further locations in China were planned, although the regional settlement details were not yet clear.

Branch office in Shanghai

On 1st July 1997, the company took the next step in strengthening its market presence: since this date, ARBURG has had its own branch office in the Shanghai German Centre. Before this, from 1989 onwards, a service technician represented ARBURG on site in Shanghai as part of a co-operation agreement. Since the opening of the office, which is subordinate to the Hong Kong branch, three staff have been responsible for sales, service and administration. From Shanghai, service is provided for the whole extended region, the Yangtse Delta and the industrial areas of central China.

Special market requirements

The Chinese market differs in many respects from the other Asiatic markets, and therefore requires special treatment and great judgement. Language, mentality and a different service culture affect contact and communication with individual Chinese customers – a demanding task, with which our Hong Kong branch under the management of Sunny Poon seems equipped to deal extremely successfully.

It was the increasing demand from long-standing European and American customers for a service provision for their new projects in China which had a not inconsiderable influence on ARBURG's decision to enter into this type of commitment in the area.

ARBURG's carefully thought out concept of taking small steps in its expansion on the Chinese market is now in full swing. A systematic market operation with essential basic activities has been undertaken both by the Hong Kong branch and the branch office in Shanghai. These are essential prerequisites for ARBURG's future ability to respond to the enormous consumer potential of China, which is characterised above all by increased quality requirements on production equipment and products.

At the moment, however, there are still many bureaucratic and market regulatory hurdles in the way of contact with China. Thus, for example, very high customs duties and rates of value added tax on machinery imports currently have a negative effect on the build up of business. Within the context of its „small steps" strategy, ARBURG is endeavouring to overcome these obstacles and to continue to extend its business contacts with China from its bases in Hong Kong and Shanghai. Quite simply, customers who are active internationally expect a presence of this kind from an international market leader in engineering construction in such an important market.

80 % of the market potential, which has been estimated at between 15,000 and 25,000 machines annually, is divided between ca. 70 Chinese companies, the technical standards being very much below those of western machinery producers. In these circumstances also, ARBURG sees great opportunities in three target areas: joint ventures, subsidiaries of international companies with their own production in China and, in future, increasingly also with Chinese partners. CD production in China has been shown to be particularly capable of expansion, and this is likely to remain of interest for the world market (producers and consumers) in the medium term also.