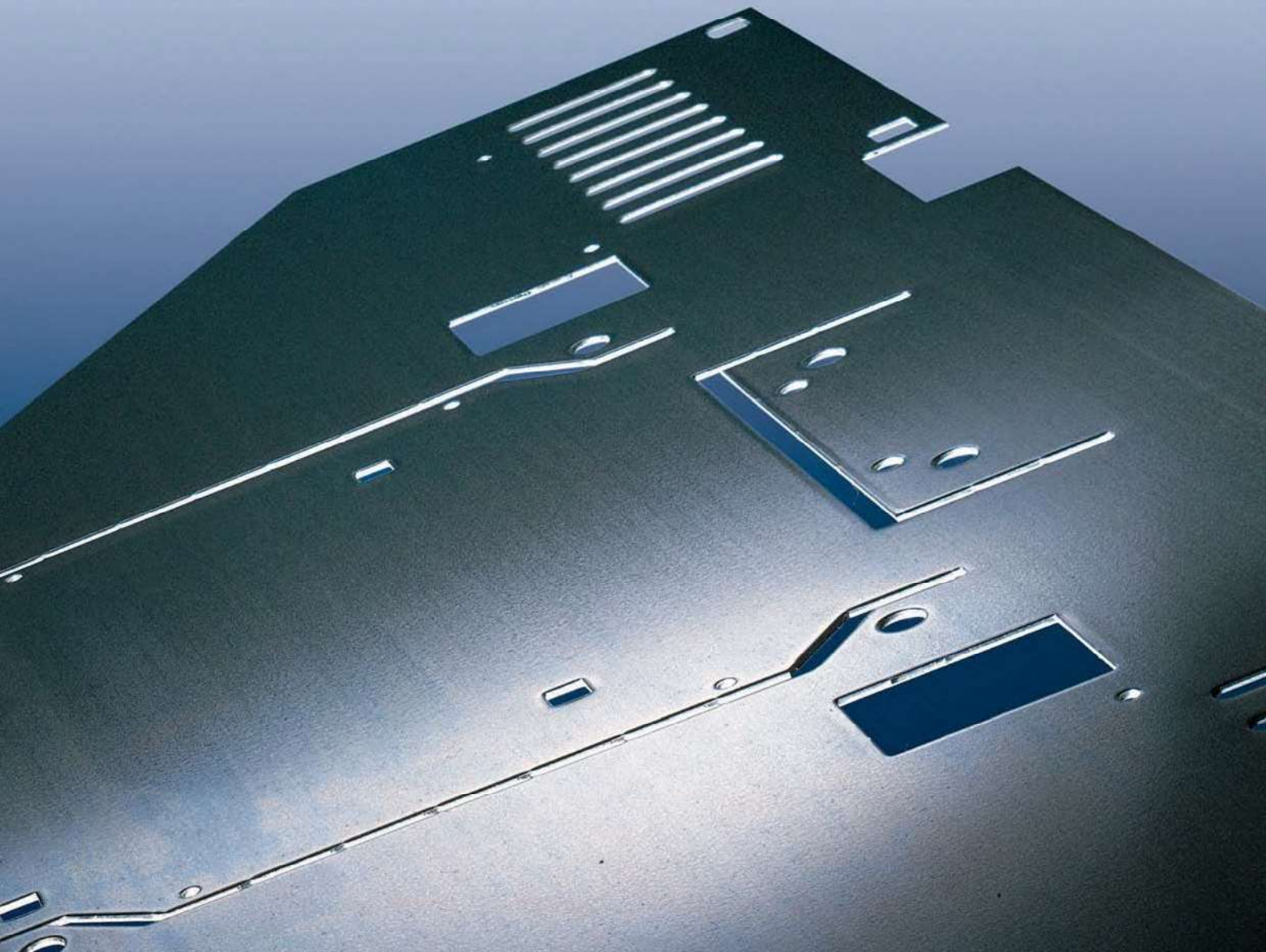


 **High-Tech  
Sheet Metal Processing  
in Allrounder Production**



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## EDITORIAL



Even though the New Year is already a few weeks old, we would like to take the opportunity of this first issue of ARBURG Today to express to you our best wishes for good health and prosperity in the year 1997. For ourselves, we hope that our many and rewarding personal contacts will continue, and that they will be expanded in the coming months for everyone's benefit .

The old year ended for ARBURG in the same way that the new one began: with the opening of a new branch office. After our subsidiaries in Turkey and the Czech Republic opened their doors for business last year, we had the pleasure of celebrating the opening of our Danish branch at the beginning of this year.

The demands of the global marketplace today require rapid and, above all, decisive action. This will surely be even more critical in the future. Global concepts must function effectively in a decentralised manner, that is, in terms of individual countries, in order to reach every customer optimally and to satisfy unique requirements on an individual basis. For this reason, ARBURG will continue to place major emphasis on an even stronger presence in significant markets.

It's a known fact that rapid and direct communication is an essential basic requirement for economically successful operations today. And it is also recognised around the globe that ARBURG has always stood for efficient production.

However, it's not just that ARBURG machines produce cost-effectively. We attach great importance to this decisive feature in our own production as well. For that reason, we will introduce you to our state-of-the-art sheet metal processing centres which guarantee a highly efficient method for automated processing of flat metals. Our objective is to optimise our own production so that customer-oriented manufacturing of our successful Allrounders is possible while continuously maintaining standards of productivity, versatility and profitability.

We hope you will enjoy hours of informative reading with our new ARBURG Today.

Sincerely,

E. Hehl

K. Hehl



Top left: Kurt Schaber  
Top right: Eberhard Lutz

## A Review of 36 Successful „ARBURG Years“

### A Key Figure Bids Farewell to Active Professional Life

**As only a few other prominent figures at ARBURG, one man helped to define the development of the company. He has now withdrawn from his active career pursuits to begin a well-earned retirement. The man we're talking about is Kurt Schaber, Sales Manager for Germany. After 36 years in the company, he turned over his responsibilities to Eberhard Lutz, a Bachelor of Engineering who will take over the reins in Sales for Germany and look after the needs of our customers.**

Kurt Schaber, as the offspring of skilled craftsman's family, literally received his business insight in the cradle. After his education which followed the dual paths of trade and business, he began his professional career near Stuttgart before he came to ARBURG in Lossburg in 1960 as Sales Manager for Germany.

Together with Business Manager and Executive Partner Eugen Hehl, Kurt Schaber set about with determination to develop sales infrastructures in Germany. He promoted the build-up of an efficient network of Sales Consultants and Customer Service locations with the same steady determination as he showed in his support for customer training, diagnosis by telephone, comprehensive and application-technical consultation or effective spare parts systems.

In the years of his professional activities, his customers came to know him as a reliable, honest and exceedingly good-natured business associate on whose judgement one could always rely. This may be attributed in no small measure

to his positive Swabian character traits. Hard work and commitment, but also modesty and a good measure of skill in negotiations made Kurt Schaber into a man that you simply felt you could trust.

In taking a look back, the thing that first impressed him about the company whose development he was instrumental in shaping, and which put its stamp on him as well, were the remarkable dynamic forces of growth. In 1960, the year he came on board with the enterprise, the company had a total of exactly 120 employees. At the end of 1996, over 1600 people were working for ARBURG.

This is a number which represents the success story of a company which has since become a globally active high-tech concern with strong innovative energy. This breath-taking climb is due in no small part to his commitment. Nevertheless, Mr. Schaber is still occasionally surprised even now in the face of this fact and the pleasures associated with it.

Today, he evaluates his 36

“ARBURG years” as a time which was more than occasionally stressful, but which was above all a wonderful time that was rich in experiences. It was not just a sense of duty which was a driving force behind him, but also the widely-varied and rewarding personal contacts with his professional associates, several of whom became friends as time passed.

His successor, Eberhard Lutz, is taking on demanding tasks from Kurt Schaber. He sees the success of ARBURG - and this is the link to his predecessor - as closely tied to the success of ARBURG's customers. Mr. Lutz is also prepared for taking on this work in the best possible way as a result of his five years of activity as Manager for Technical Customer Services.

And it's not just his predecessor who thinks that he is exactly the right man for this job. Eberhard Lutz is a dedicated business associate who will carry on the important traditions in this area while also providing new impulses.

### Excerpt from „ARBURG heute“ from 1970



### Einer von uns

Kurt Schaber



Man hat auf Anhieb Vertrauen zu ihm. Sein bescheidenes Auftreten, seine bedächtige Art, sein offener Blick, sein menschlich angenehmes Wesen – das schätzen alle, die mit ihm zusammen arbeiten. Das Erscheinungsbild des nahezu Vierzigjährigen täuscht nicht: Kurt Schaber ist kein Windmacher, kein Schaumsträger und schon gar kein Nervenbündel, sondern trotz anstrengender, vielseitiger Berufsaufgaben einer der ruhenden Pole im täglichen Wirbel des Betriebes. Indes, er schont sich nicht, wenn es gilt, den oft ungewöhnlich großen Anforderungen, die sich im Verkehr mit Kunden und Vertretern ergeben, in vollem Umfange gerecht zu werden. Die sogenannten „krummen Dinge“ erledigt er meistens selbst. Zuverlässigkeit ist sein oberstes Gebot. Was er verspricht, hält er. Diese Worttreue verlangt er auch von seinen Mitarbeitern. Sein Werdegang: Nach Besuch der Oberschule und nach kaufmännischer sowie gewerblicher Lehre war er mehrere Jahre in verschiedenen größeren Firmen im Stuttgarter Bereich tätig. 1960 kam er zu ARBURG, wo er die Verkaufsabteilung Inland leitet. In freien Stunden widmet er sich der Familie und dem Sport. Für gute Witze ist er immer empfänglich; sie sind für ihn eine Quelle erfrischender Heiterkeit. Auf Kurt Schaber trifft zu, was Schopenhauer einmal sagte: „Je mehr ein Mensch des ganzen Ernstes fähig ist, desto herzlicher kann er lachen.“  
P. D.

# Allrounder 520 V 1300-575: Versatile Production of Multi-Component Parts

Whether it's in automotive manufacturing, in electronics technology or in the area of medical technology, the demands made on plastic products have risen sharply in recent years. The manufacture of multi-component products has also been extensively influenced by this development.



**ARBURG's large 4-component machine:**  
The 520 V 1300-575 Allrounder

These increasing demands and the ongoing technical developments which have resulted from them in the field of multi-component injection moulding have made it necessary to be able to produce more and more complicated and - at the same time - more specialised products from different source materials or with

several colours in one operation. Today, even the combination of several colours and materials no longer represents a technical problem.

A mould for multi-component injection moulding generally has two or more stations at which the individual components are injected either simultaneously or sequentially,

However, in this type of demanding injection moulding process, the challenges for machine technology are greater than with single-component injection moulding for reasons beyond just the complexity of the moulds.

ARBURG long ago recognised the significance of the progressive technical developments in this field. The result was the construction of multi-component versions of machines which had already proven themselves. With four injection units, the Allrounder 520 V, with clamping platen dimensions of 520 x 520mm, takes its place as the flagship of these multi-component machines. Next in line, there is the smaller Allrounder 420 V version (420 x 420mm) which has the same options available in terms of injection equipment. In 2-component machines, the M-machine series is available in machine sizes of 270 M, 320 M, 420 M and 520 M, while the V-machine series is offered here in ratings of 420 and 520. The 420 M,

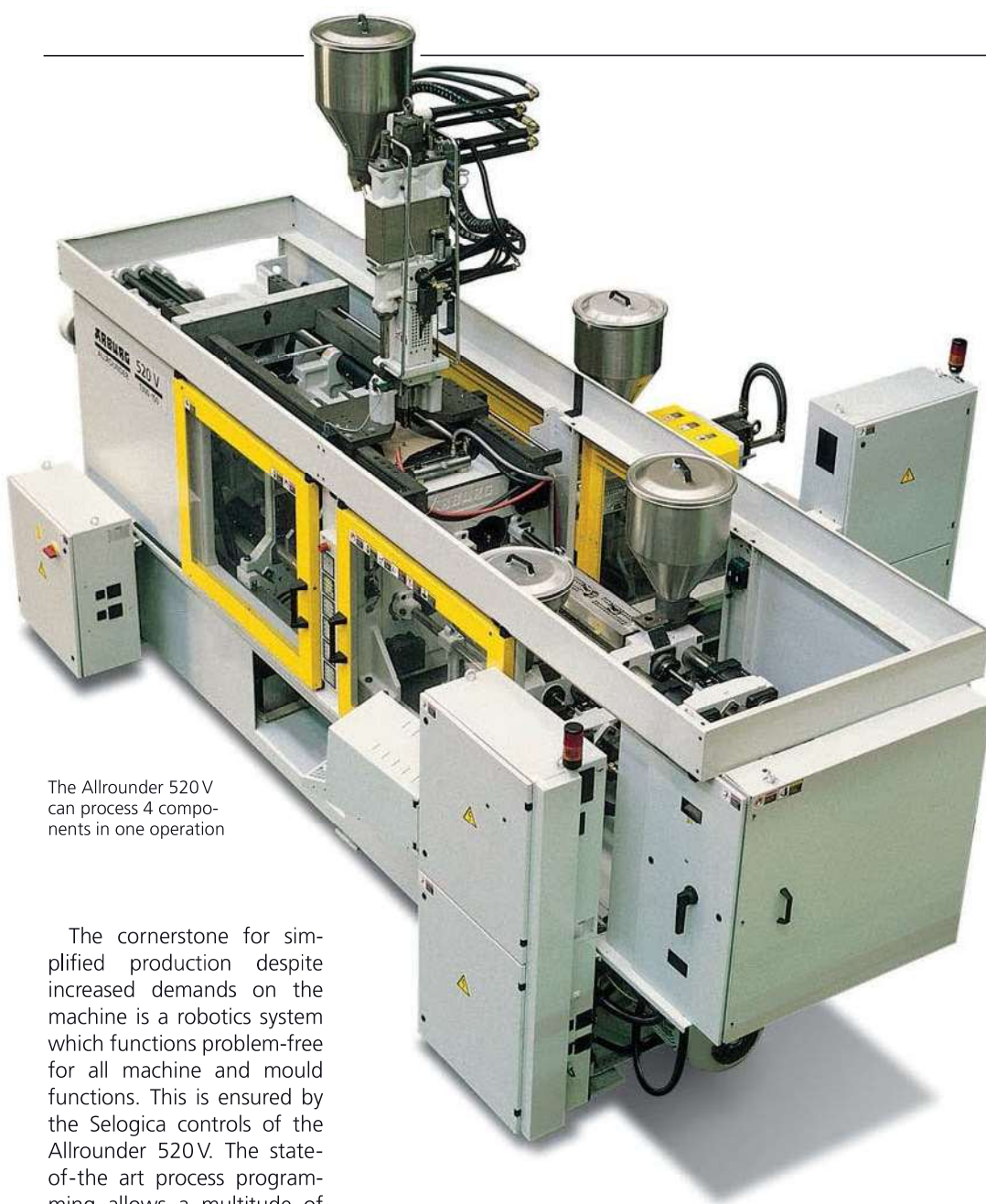
520 M, 420 V and 520 V may be ordered as 3-component machines. With these machines, ARBURG can provide a range of modularly constructed machines which make cost-effective production of even the most demanding injection moulding parts possible.

The 4-component 520 V 1300-575 machine which is introduced here represents a combination of two 2-component machines in its basic engineering design. Beginning with a base machine, a second machine segment with its own controls and one or two injection units is added at an angle of 90° to the machine base. The added machine does not have a clamping unit. Two of the four injection units of the 4-component machine are positioned horizontally on the machine base of the first machine segment, the third injection unit injects at the parting line, and the fourth is placed in an L-position on the rear of the machine. In this manner, the operator's side of the machine remains completely free. The individual units of ARBURG's multi-component machines may also be operated individually, so that the machines provide an immense range of production options as a result of the possible variations of injection units employed.

Control of the two machines is managed through the monitor and keyboard of the base machine. The first machine is synchronised with the second machine for operation mode, sequence synchronisation or alarm conditions by means of an electronic interface. Both controls may thus be programmed and operated from the operator's station. The motions of the injection unit and all functions pertaining to the mould (heating, for example) are thus monitored by the control unit of the first machine. The independent programs of both machines may be changed as required by a toggle switch on the monitor.

An injection moulding unit working at a 90° angle





The Allrounder 520 V can process 4 components in one operation

The cornerstone for simplified production despite increased demands on the machine is a robotics system which functions problem-free for all machine and mould functions. This is ensured by the Selogica controls of the Allrounder 520 V. The state-of-the-art process programming allows a multitude of possible combinations in the injection cycle. The entire process sequence may be managed through the hierarchically logical structure of the control unit's technology. The Selogica control unit has a full-graphics Process Editor which is oriented directly to the production process. With this, it is possible to compile even highly complex process sequences - such as cycles with multiple core pulls - simply, surely, and above all with time savings, directly and clearly viewable on the monitor. The user-defined programming as well as the expanded control, documentation and help functions of the Selogica control unit do the rest in simplifying manufacturing with precise reproducibility of multi-component injection moulded parts.

#### Cost-Effective Purchase and Performance

When taking economic factors into consideration, not only the production process, but also the procurement of a multi-component machine has to be as cost-effective as possible. As is widely known, the basic concept of the Allrounder is generally modular. In other words, every machine may be configured within a broad range in a building-block system to match the customer's exact needs in the specific application. For the machine purchaser, this has the benefit that he may adapt machine technology directly to the requirements of his operation.

For ARBURG, this means the advantage of the extensive use of existing standard manufactured parts, which in turn allows management of machine manufacturing - and thus the

valve is also available as an option here. Hydraulic operation of the rotary mould platen is driven by one of the core pull devices of the machine. Since the hydraulic systems of both machine segments remain independent, they may be separated for transport.

#### Efficient Injection Moulding Solutions from the ARBURG Company

With the multi-component injection moulding technology of the Allrounder, the design and monitoring of complex manufacturing processes no longer presents a problem. Efficient injection moulding solutions with the V models from ARBURG allow the implementation of innovative ideas, and thus facilitate the injection moulding operation's manufacturing and quality assurance of products which have superior value.

The combination of convenient controls and problem-free, proven machine technology makes the production of multi-component parts simple and reliable. The result is a production process which is not only easier to supervise, but also faster and more economical.

sales price - within acceptable levels. This is again an advantage which benefits the customer.

#### The Hydraulic System of the Large Multi-Component Allrounders

In the two-component versions, the large Allrounder V machines are basically equipped with one primary pump per injection unit and one holding pump for generating pressure. The electrical drive and the pump output are dependent on the ratings of the injection units which are employed.

An electrically-operated valve handles the job of closing stroke protection, while core holding pressure is manually adjustable in standard production. However, a programmable pressure proportioning

# Management in Tune with the Times



Manager Michael Grandt

**The challenges arising from the globalisation of commercial markets which are faced by an innovative company with the worldwide activities such as ARBURG increase and change constantly. As is reflected in the words of Finances and Organisation Manager, Michael Grandt, the ARBURG Group has recognised the significance of this development by the utilisation of up-to-the-minute organisational structures and data-processing technology. It's not just in technical developments that ARBURG intends to keep in tune with the times.**

The executive management area of Finances and Organisation is subdivided into the areas of Finances and Accounting as well as Information Systems.

The responsibilities in Finances extend from accounts receivable and payable, fixed asset accounting and all financial transactions, especially with overseas subsidiaries. In addition, the preparation of annual financial statements is the responsibility of this department.

The area of responsibilities in Accounting include cost estimating, controlling, as well as activities in the area of managerial analysis. Controlling especially includes a number of tasks since it functions as a service provider in support of such areas as Production, Sales and Marketing, Data Processing, and others. Financial Controlling and Investment Controlling round out this department.

The responsibilities of the Information Systems division reside primarily in the Data Processing departments. Because of the highly divergent areas of operations at ARBURG, Data Processing has taken on a key role and requires extensive application and system programming as well as network support. Additional areas of responsibility are in internal training for data processing, communications and the procedural organisation in company administration.

## The ARBURG Philosophy

The development of the ARBURG company, in the words of General Manager Michael Grandt, has been decisively influenced in the past - and will continue to be so in the future - by the leading technologies of its products as well as by the superior qualifications and strong motivation of its employees.

In 1995, ARBURG was distinguished for its all-inclusive quality management by Certification

in compliance with ISO 9001. Long before this, company management had already recognised that this official confirmation of the Quality Assurance system could not be defined as the only goal. Instead, parallel changeover processes had to be successfully implemented for employees, who in the final analysis create first-hand the quality which is demanded by ARBURG.

As Mr. Grandt emphasised, such factors as corporate culture, philosophy and the objectives of the company are the fundamental influencing factors which must be instituted for a comprehensive understanding of the concept of "quality."

ARBURG's corporate philosophy consists of several partial areas which supplement and build upon each other. The cornerstones of this philosophy are the corporate mission statement, management's guidelines, corporate objectives, and quality policies. The corporate mission statement is an expression of the personal concepts and the high demands made on employees and machines:

**"ARBURG. Allrounders for Economical Injection Moulding"**

Management's guidelines should be binding rules from which employees can orient their course of action in performing their daily work.

In terms of corporate objectives, ARBURG has firmly maintained the established criteria for the development of the corporation. Safeguarding the future by innovative and undeviating customer service and progressive financial policies stand clearly in the foreground.

Striving for quality has always belonged to the most important economic and competitive factors for the ARBURG Group. The highest demands for quality must be met anew every day, because it is only in this way that ARBURG can maintain its competitive position.

### Strategies in Controlling and Information Systems Management

The necessity for building meaningful systems of controlling out of the existing accounting practices was recognised early on at the ARBURG company. This instrument is utilised for the clarification of questions of management analysis which relate to the entire company as well as for management of operating results and cash flow. In the last five years especially, ARBURG Controlling has been additionally refined with goal-oriented expansion.

ARBURG's controlling objectives are aligned closely with those of the corporation. In the area of operations, controlling serves for managing profits and as an early warning system, while in strategic planning it serves as a means for ensuring the long-term continuity of the company by early recognition of future risks and opportunities.

Controlling for the entire corporate group is headquartered centrally for the organisation in Lossburg. It is responsible for cost estimating and for plant and investment controls for the subsidiaries. In all planning, ARBURG has made it a principle to select a comprehensive view of the Group as the basis for all decisions in order to achieve optimal results from the view of all of the associated companies. It is for this reason that controlling is employed as a cross-functional management instrument at ARBURG.

The four main responsibilities of controlling are planning and - related closely thereto - variance analysis, providing decision-makers in all divisions and levels with necessary information, and the co-ordination and control of the company by co-operative efforts during creation of conceptual blueprints for future-oriented

strategic planning. Because of the variety and breadth of its activities, ARBURG plans to expand controlling functions even further in order to keep pace with the future demands of the marketplace.

### Information Systems Management

In the area of Information Systems, the principles of integration and of the construction of uniform data bases are observed for all of the companies belonging to the Group. For employees, this means thought and action processes, project and team work as well as communications which cut across departmental lines with continuity.

For such departments as Finances, Sales and Marketing, Engineering, Time and Materials Management, Production, Personnel and others, and for their planning and evaluation programs, ARBURG possesses an IBM 9672-RX3 mainframe computer system. This future-oriented system, which is based on the latest CMOS microprocessor technology, is especially efficient in energy consumption and low in maintenance. Special applications, above all engineering and technical applications (program development for ARBURG machine controls, CAD engineering in machine construction), are integrated into the ARBURG information systems environment through the latest token-ring network technology. This network also provides the link for more than 30 PC servers with special applications as well as over 1,000 end-user workstations.

For ARBURG - as for any other high-tech industrial company - information or data are of extreme importance, specifically corporate data in this case. The tremendous significance of electronic data

processing is underscored by the investment in disk memory capacity of more than 1.1 terabytes (more than 1,000 gigabytes).

As a preventive measure against possible catastrophic failures, ARBURG opted for complete disk mirrored protection in widely separated rooms. Thus, in the event of a total system failure, a restart can be reduced to a minimum of downtime.

All of the subsidiaries in Europe and the USA are linked online with the mainframe in Lossburg and can therefore work with all of the available applications whenever necessary.

Machine configuration management, spare parts and service applications, the system for customers to place direct orders through "T-Online" as well as the new information system for Field Service with its multimedia applications - the External Information System (EIS), as it is called - form the area of sales promoting and supporting data processing applications.

In the area of developmental engineering, ARBURG has converted completely to CAD. Over 100 CAD workstations are integrated into the plant's parts and bill-of-materials system, and fixed links exist to technical documentation

and NC programming. More than 80 processing machines are connected directly to the plant's computer system. At the 1,000 computer workstations at ARBURG, approximately 800,000 transactions are completed every day. Even so, because of the outstanding technical equipment, the average response times are well under one second.

In the areas of data processing and modern organisational technologies, only the best is good enough for ARBURG, as for its technical products. This demand serves ARBURG, and it serves the customer as well.



The new Field Service Information System: Efficient customer consultations using a Notebook

# Legrand: Ready-For Sale Products in One Operation



The Legrand Company, a manufacturer of electrical fixtures for housing installations, has been working in Limoge with the Rapi-domat mould changer from ARBURG since 1994 and is completely satisfied with the results.

Legrand has 18,000 employees around the world, and supplies everything which relates to housing electrical installations. Products range from small, high-volume electrical parts all the way to leading-edge technological systems in the household electronics sector such as remote control units for alarm systems, complete lighting systems and all other power consumers in the building.

## Plastics Processing with Superior Quality

Approximately 3,700 people are employed at the production locations in the Limoge region. 200 injection moulding machines, of which 50 are dedicated to the production of thermoset parts, are in operation. These machines process approximately 12,000 metric tons of widely varying materials annually. If all of the other production locations in France, Europe, the USA and Russia are taken into account, the numbers above can all be tripled.

At company headquarters in Legrand-Limousin, the entire technical expertise of the company is concentrated, especially for different special products and small electrical accessories. Socket receptacles and divider sockets as well as switches are produced as large-scale standard items.

The Plastics Processing area and its Manager, Michel-Gabriel Janicot, especially include the CERP (Centre for Research and Development in Plastics Technology) in their activities. There is close co-operation between the engineering office, NC programming, mould construction, process optimisation as well as off-line reworking,



all of which work at the same location. Between 120 and 150 moulds are produced every year, which covers 80% of the requirements of Legrand-Limousin.

## Optimal Initial Sampling

The initial sample section for testing and optimisation contributes simultaneously in many ways to the future safeguarding of the company. Here, trainees are given instructions on the injection moulding machines. In addition, testing is performed in this department with moulds which will not actually be used in production until a later time.

An example of this is protected socket outlets with a double seal which are produced by injecting around both sides of the part with thermoplastic elastomers (S-EB-S) in a two-component mould with a rotary platen.

The company is always looking for innovations which will yield a profit. In 1995, the CERP, working together with the department for assembly systems, completed a production island for injection mould-

ed parts and their assembly which realised the greatest possible degree of automation.

## One Operator for 12 All-rounders and 17 Moulds

A relatively new product group which was first marketed in January of 1995 is manufactured at this production island. At the initial point of the production line, there is a central materials supply device which charges the 12 integrated ARBURG Allrounders with three different plastic granulates. After manufacturing, assembly and labelling, the components pass through a shrink-wrapping and packaging machine, after which they are prepared for shipping. All of the work processes



between these two stations, including mould changing on the injection moulding machines, are performed with full automation.

The overall system allows the assembly of parts which are produced in different quantities. Many products fully utilise the capacity of one or even several injection moulding machines. On the other hand, other components require only half of the available output of a machine. As a result, one portion of the Allrounders is always equipped with only one mould, while two moulds are installed on the remaining





machines. The fully organised assembly process demands a minimum of intermediate storage, thus making frequent mould changes necessary. This must be performed within the shortest possible time and with a minimum of labour outlay. A comparison between three manufacturers of injection moulding machines showed, as Michel-Gabriel Janicot said, that the technology available with the ARBURG machines provided the greatest possible reliability, which was also true given the practical solutions already in place at Legrand. Therefore, the decision was made in favour of the injection moulding technology of the Allrounders.

#### **Project Formulation and Implementation by Plan**

The project formulation work for the overall system was begun at the end of 1993 and concluded in February, 1994. ARBURG delivered



**Production, finishing, packaging:**  
Flush-mount divider sockets, ready for sale in one work operation

a total of twelve Allrounder 370V machines with Selogica controls, of which nine have 800kN of clamping force, while the other three are rated at 600kN. The "ARBURG production island," as it is called at the plant, was tested until autumn, and went on stream for production at the end of 1994.

Six of the 12 Allrounder V's are outfitted with the Rapidomat automatic mould changer. More than 15 minutes before the exact point in time established for the mould change, the Selogica gives the command to the thermal unit to heat the mould required for the following production step. Each of these moulds, which are utilised alternately on the machines, remains connected to "its own" thermal unit. As a result, the thermal equilibrium is not disturbed when the mould is changed.

#### **Changeover Function**

The total time required for the mould change is 1 minute and 30 seconds, calculated from one good part to the next. Here, the fact that the first part injected with the follow-up mould is automatically sorted out as a defective part is already taken into account. The high degree of automation of the entire system means that only a single operator is required to oversee the entire ARBURG manufacturing line.

#### **Total Control via the Selogica**

Nine of the 12 Allrounders are outfitted with ARBURG three-axis NC robotics handling systems whose programming is fully integrated into the machine controls.

The handling devices remove the parts from the mould and place them on conveyor belts which are positioned above the Allrounders. The belts take the injected pieces directly to the assembly line. Each of the Allrounders with the Rapidomat changer supplies two conveyor belts, which are matched in turn to the specific part. The programming of the robotics system, including all of the pick-up and placement motions, is changed simultaneously with the machine program.

#### **Quality Control**

Automated quality control is also run by the Selogica



controls. Any finished injected part which lies outside the programmed tolerances is automatically set aside into a reject bin. The controls also give instructions to the robotics system to place sample parts aside at a specified position in programmed time intervals for statistical evaluation. In the event of a blockage of the conveyor, a specific number of parts may also accumulate without triggering an alarm message.

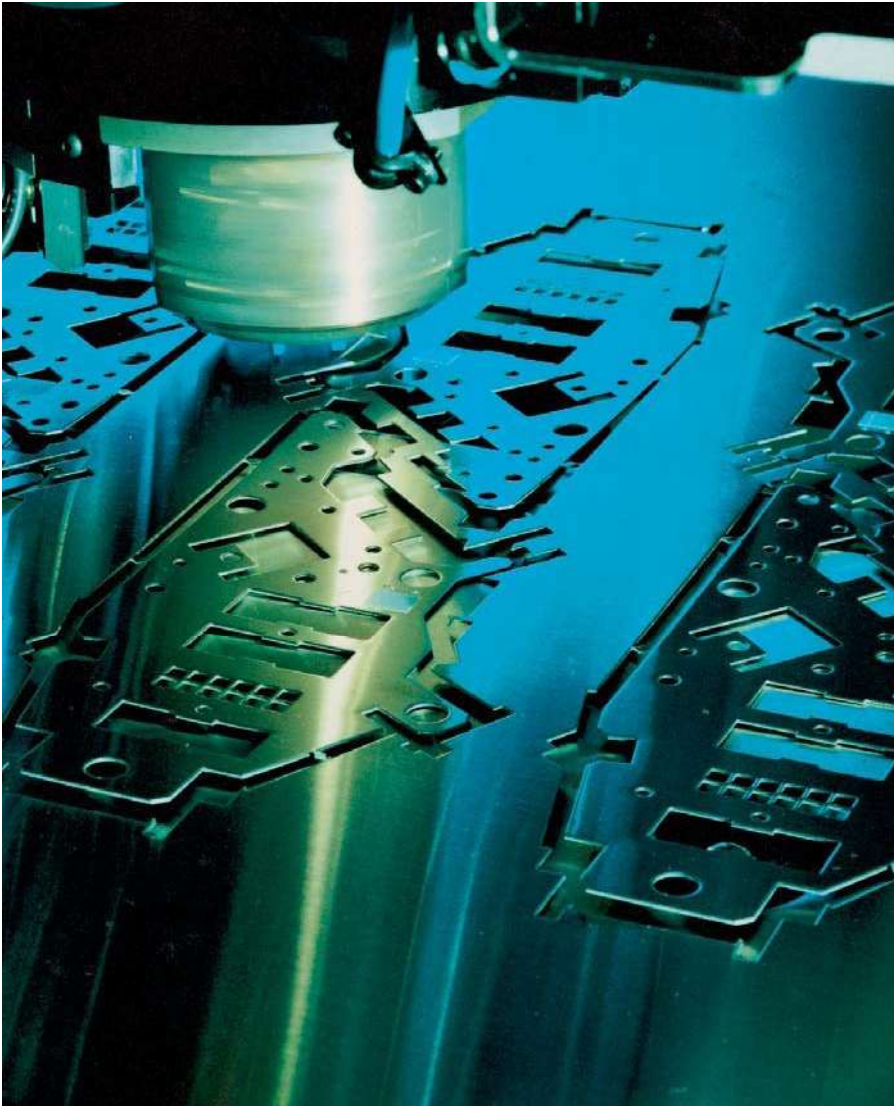
#### **The System is a Success for ARBURG**

The implementation of the system described here is a remarkable success. It wasn't just the technology which went into operation without problems from the very beginning. Along with Legrand, the Jäger-Veglia Company of Amiens, and Mital & Plastic, Oyonnax, are working successfully in France with the Allrounders and automatic mould changers. The ARBURG production island marks a significant step forward in the ongoing development of Legrand-Limousin away from manufacturing processing and toward an organisation which is oriented to products.

In comparison with traditionally-equipped machines, the costs for a fully-automated system are certainly higher. The excess costs, however, must be brought into relation-

ship with the productivity increases which may be expected. These increases will exceed the savings which would result from manual processing by a wide margin. And the quality and efficiency criteria according to which Legrand applies its highest standards are at least equally important.

# It's Not Made of Cardboard: Flexible Sheet-Metal Process- ing as the Basis for Efficient Series Production



While the German word for sheet-metal - "Blech" - may also mean "nonsense" in a phrase from everyday language, when someone at ARBURG uses this term, he's generally not referring to that expression, but rather to a highly efficient method for automation in processing flat metals. The essential point here is to produce in such a manner that customer-oriented series production of Allrounders is possible while maintaining constant standards of productivity, versatility and profitability.

Because of the extreme manufacturing depth which ARBURG implements because of the comprehensive quality demands it places on the production of its Allrounders, the greatest portion of sheet-metal processing is performed in the plant at company headquarters in Lossburg. Along with areas for bending and joining, this is also the case for processing of flat sheet metal.

For this, a Trumatic Top Twin sheet-metal system for large pieces is available, along with two Trumatic TC 260 processing centres manufactured by the Trumpf Company. One of the two systems stamps, nibbles and shapes, while the second manufacturing unit, a combination TC 260 laser press machine, integrates a "classic" stamping machine as well as a 1500W laser station.

Combination machines combine the technologies of the stamping process and laser cutting, whereby standard geometries and reshaping are stamped, and filigree contours or thicker sheet-metal are cut with the laser. Each sheet-metal part is therefore produced making use of the best possible technology. The first of the two Trumatic production units

in current use at the plant was purchased in 1990. On this machine, and on the combination machine, sheet-metal with thickness' between 1 and 8 mm is processed. For thickness' up to 3mm, parts are stamped, while thicker parts are cut with the laser. Process times differ depending on thickness and the specific job requirements. They range from a few seconds up to almost one-half hour.

The two stamping machines form the core of the actual manufacturing units for sheet-metal processing. They also take on the task of loading and unloading via a lift, and dispose of scrap remnants fully automatically.

Each of the two machines has more than 10 tool positions. By the application of Multitools, however, a much greater number of stamping geometries is available. This comprises a rotating multiple tool set which integrates different stamps and matrices.

The stamping head rotates 360°, thus making machine application even more universal, since each of the tools may be moved in a defined manner. As a simple example: by rotating a four-edged tool by 45°, square and rectangular stamping work may be performed in standard production. The average equipment per unit is 20 tools which are located in an automatic tool changer, while the laser handles a large number of geometries as a universal tool.

The high productivity of the machines may be seen very clearly from two reference statistics. The maximum processing speed of the clamped sheet-metal is at 106 meters/minute in the x and y directions, and the maximum number of stamping strokes per minute is 500. The sheet-metal processing centres at ARBURG can thus be operated with a correspondingly high material throughput, which makes extremely versatile just-in-time job processing possible.

Metal panels for switch box-

es, machine bases and protective devices for the Allrounders are primarily processed on the two Trumatic systems. During production, two of the three machine shifts are run by operators. Among their other tasks, the technicians ensure that the sequential programming as well as the material supply flow are in order and that the entire production sequence functions without problems. Night shifts and production on weekends run completely automatically.

A glance at some statistics depicts just how reliably the stamping process functions.



**Precise contours** achieved by a combination of stamping and laser cutting

Both centres operate approximately 6,000 hours annually, whereby 350 metric tons of sheet-metal with a thickness of 4 mm alone go through the stamping and cutting tools. Maintenance time, which totals an average of 180 hours annually, is a very modest figure when compared to this. This means, in other words: along with the required versatility and productivity, the profit aspect is also right.

The last step in the direction of fully-automated job processing and direct production implementation was taken at ARBURG by the networking of NC machine programming and the in-house CADAM system. In principle, Engineering, Work Planning and NC Programming are linked in such a way that the relevant NC data are



**Optimal use of materials** by nesting of the jobs directly onscreen

With these universal and efficient facilities, ARBURG can provide fast and co-ordinated manufacturing of Allrounder components for series production, and can also shift to special customer requirements on an individual basis. This is all performed at the same consistently high quality standard. The basic principle that only versatile machines - in other words, "Allrounders" - are to be employed in order to produce the reliable Allrounder injection moulding technology is also true in sheet-metal processing.

generated automatically for every work piece from the engineering drawings in the work preparation phase (abbreviated "AV" for "Arbeitsvorbereitung") and transmitted directly to the processing centres.

ARBURG employs the JET-CAM II Plus programming system for this purpose. The nesting necessary for maximum sheet-metal use is generated directly at the machines.

By utilising this procedural method, not only are work and time processes optimised, but possible sources of errors are systematically eliminated. It is still possible to perform any special adaptations in the production process directly at the machines. As a result, the highest versatility of the manufacturing units may always be fully exploited.

# ARBURG Service Hotline: Hot Tips by Telephone

**Even Allrounders don't work without an occasional problem. For this reason, fast assistance is the number one priority in such cases. So ARBURG established its own Service Hotline at the beginning of 1984.**

The "ARBURG Telephone Service" has its own telephone switchboard in Lossburg which is staffed between 7:15AM and 5:00PM. After in-depth testing, this time window was determined to be the best for handling customers' questions, while telephone inquiries outside this time occur only infrequently. Anyone who does need assistance at a different time can make use of a direct fax line to the Service Engineers or leave a message on the telephone answering machine. There are four

By their very nature, most of the inquiries from customers revolve around service situations. In addition, there are also questions about initial commissioning of the machines, general technical situations or setting appointments.

If the problem cannot be resolved, other departments are called in for consultation. If this doesn't do the job either, there is always a technician who inspects the problem on site and repairs any defects.

## **The High Reliability of ARBURG Machines Places Special Demands**

The truly difficult aspect of telephone diagnosis is not the conversation concerning technical matters in itself, but rather that the questions are oriented to the entire spectrum of Allrounders which are still in operation. In other words: a Service Engineer is confronted with questions on the telephone about the Selogica control unit as well as those concerning the first manually-operated, piston-driven injection molding machines from ARBURG, and he must be able to give sound advice in both cases. That such machines are still in use today is a proof of the high reliability of the ARBURG technology.

However, the Service Engineer on the telephone must also know all of the peripheral equipment as well, and also the special machines and project facilities which are utilised at customers' locations. To round out this challenging job, there is the fact that customer inquiries do not come from Germany alone, but rather come in to Lossburg from branches and agencies all around the globe.

## **Proven Abilities with Expertise are in Demand**

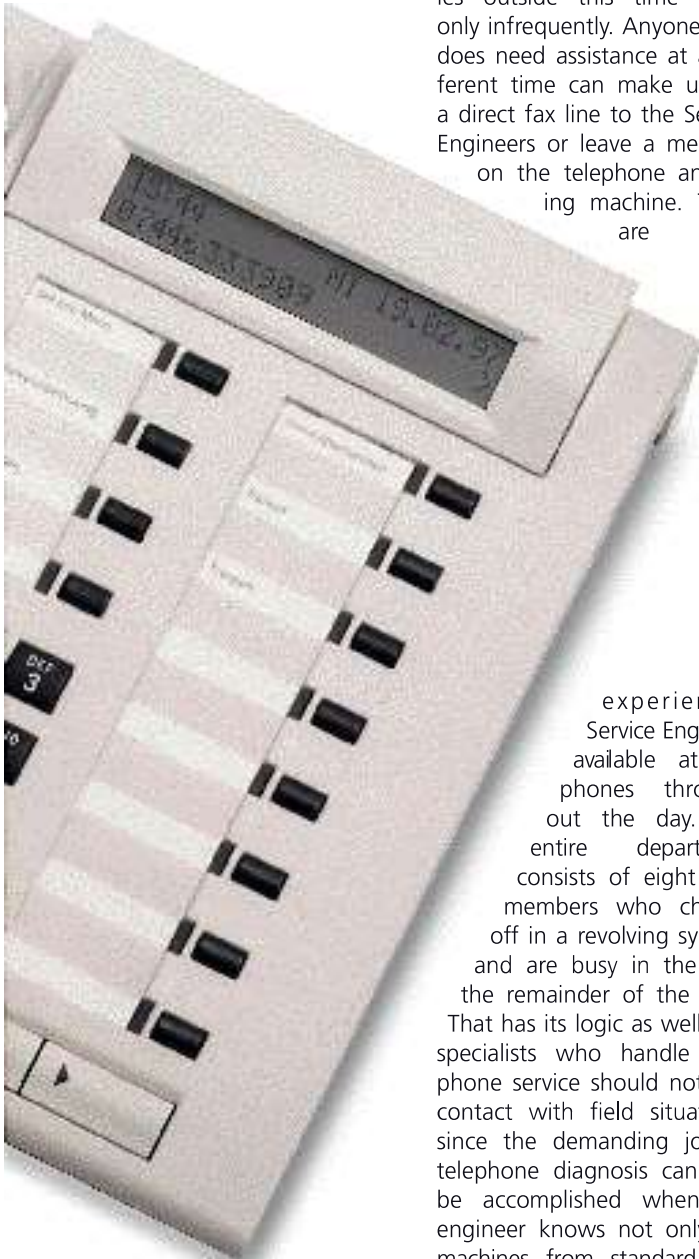
Only highly experienced Service Engineers are up to this job - those who on the one hand can call on solid training with the different machine types and, on the other hand, have at least three or four years of experience with customers in the field. And yet - even with these optimal prerequisites - when it comes to special machine groups, it is still necessary to define assigned staff members who possess the required detailed knowledge in precisely this sector of the Allrounder product line.

Data processing support provides relief throughout the entire process. A memo is compiled for every conversation which a customer has with ARBURG Service concerning a specific machine. The memo, via the machine number, is filed with the complete specification sheet for this specific Allrounder, the so-called "Machine Résumé." This computerised information may also be printed out and forwarded to the Dispatch Manager or to the Service Engineer.

The managers of the service locations function here as additional "trouble-shooters" for the customers in their area of responsibility with their own Hotlines and Service dispatching.

If one asks the "Men from Service" about the experiences they have had as "telephone spiritual comforters," they are unanimous in one point: telephone support for customers has more variety than any other task, but at the same time, it is a stressful job of a very special sort.

Because it's not just that the Service Engineers have to "hit



experienced Service Engineers available at the phones throughout the day. The entire department consists of eight staff members who change off in a revolving system, and are busy in the field the remainder of the time. That has its logic as well. The specialists who handle telephone service should not lose contact with field situations, since the demanding job of telephone diagnosis can only be accomplished when the engineer knows not only the machines from standard production, but also the special machines as well.

the phones" on the so-called "window days" on which the other staff members are off, but it is really a question of making the right decisions quickly without actually knowing the machines or the background behind possible failures. That they do their job with real commitment is shown by the high success rate. In 80% of the cases the customer, who is for the moment at a loss for advice, can be helped out so that things start running again in his plant.

### „Help Quick“

In order to get help quickly on the telephone, you should take note of the following points for your phone call:

- Precise details regarding the failure or downtime simplify the work of the Engineer on the telephone.
- The basic important factor for every service job: the machine number, with which the "Machine Résumé" can be called up and supplemented.
- And a very special request in conclusion: even if you don't get to our telephone diagnosis desk right away, please be patient. We haven't forgotten your call, even if you have to listen to a few bars of the music.

You can reach the ARBURG Service Hotline by dialling:

- 07446 / 33-39 09  
(Service Main Office)
- 07446 / 33-39 25  
(Fax)
- 07446 / 33-39 09  
(Answering Machine)

## Branch Opened in Denmark

### Now Represented by 18 Subsidiaries World-Wide

Beginning in January of 1997, the world-wide subsidiary network of the ARBURG company had a new member - ARBURG A / S of Denmark. With the start-up of this new company, we are now represented world-wide by 18 subsidiaries.

It is especially positive from ARBURG's point of view that the introduction of the new branch in the Danish marketplace could be completed entirely without problems since the "E. Oswald Plast-teknik A/S," which had been a successful ARBURG agent for years, was assumed into the company. Hvidovre will remain as the company's location. Eddy Oswald was appointed as Manager of the new branch.

The ARBURG Group, which engages more than 1,600 employees around the world at this time, will be strengthened by a committed and proven Sales and Service team

with the opening of the new branch. Branch Manager Eddy Oswald is optimistic that ARBURG's market share in this traditionally-important European marketplace can be even further strengthened by his team's contribution.

From ARBURG's perspective, the company has taken a further step on the path toward the implementation of its sales and support strategy with this opening. It is the stated goal of the ARBURG Group to be represented in all important marketplaces with its own branches in order to maintain consultation, sales and support organisations at the desired level.

The new branch was formally incorporated into the companies of the ARBURG Group with a ceremonial opening on January 16 in Billund.



Eugen Hehl the Business Manager and Executive Partner at the opening in Billund

### A Family Operation in the Very Best Sense of the Term

Employees Remain Loyal to the Innovative Family Business for Unusually Long Periods

When it comes to employee statistics, ARBURG can truly be proud. Every one of the nearly 1,400 employees at company headquarters in Lossburg has been working there for an average of more than ten years. And even so, the average age of the employees is only about 34 years.

In 1996, six men and women were honoured by the company on their 25th anniversary with the company. Another 68 were honoured for their ten years of company service.

#### Seniors' Day: History and the Future

But the positive atmosphere doesn't just predominate with those still employed at ARBURG today. In December, the ARBURG Seniors were invited for an informative afternoon at "their" former company. For those who were no longer so agile afoot, a special "tour vehicle" was designed and constructed for the occasion.

Seniors Sightseeing with the Tour Vehicle



# Quality Every Time

**ARBURG has thoroughly recognised the significance of increasing demands in the area of comprehensive quality control and documentation in the plastics processing industry. The response is the development and modular expansion of a machine-based design for quality monitoring.**

A total of seven differing elements are brought together in ARBURG's overall concept for modular quality control. They are:

- The regulation of all important key variables
- The incorporation of peripheral devices into the machine controls
- Quality monitoring
- Selection unit and error analysis
- Process documentation
- Comprehensive evaluation of manufacturing by means of statistical functions using AQS
- The support of the AQC (ARBURG Quality Control) system for online quality monitoring supported 100% by process modelling

All of the elements listed may be used jointly. They support each other in their functions and supplement each other in their effects. Because of the wide range of this modular system, cost-effective solutions which are exactly tailored to the specific operational quality requirements may be realised.

## Regulation with Benefits as Compared to Controls

Regulated machine parameters are subject to a comparison of target and actual values. If differences occur as a result of machine interference or other influencing factors, compensations will be made, either by the machine controls or by regulation valves. Therefore, regulated machine variables lead to more consistent

production with better reproducibility.

All regulated variables may be programmed and stored through the machine control unit, which further improves the reproducibility of the manufacturing process. The most important parameters of the Allrounder S, M, C, T and V series are already regulated in series production or may be equipped optionally with this type of regulation.

## Peripheral Devices May be Integrated into the QS System

As an option for the S, C, and V Allrounder series, interactive interfaces may be supplied. Up to four thermal units, such as electrical mould heating circuits or hot runner regulating devices, may be linked to the interfaces.

## Comprehensive Monitoring Improves Quality

Basically, there is a difference between two types of quality monitoring:

- Functional or process-monitoring
- Quality controls

For monitored functions or processes, the machine is brought to a stop immediately if a tolerance is exceeded, or at the latest point, at the completion of a cycle.

Under the concept of "Quality Monitoring," variables which are generated from the machine's adjusted specifications as a function of the formed part and the environment during the injection process are compiled. These "Quality Monitoring Variables" may be incorporated into the machine-related error evaluation and then used for the selection of defective parts, for example.

The different procedures for quality monitoring may be expanded further by the addition of supplemental interior pressure measurement. With this feature, the material pressure phases in the mould may be graphically displayed and monitored.

The new Selogica machine control unit from ARBURG



Up to 16 machines may be simultaneously monitored with AQS

also allows the monitoring of process data in graphic form. With this, mould internal pressure curves, for example, may be controlled with parameters such as peak value or curve integral, but also with tolerance ranges around the process curve.

“Reference value determination” makes the input of target values for monitoring possible through the keyboard. These values are generated from the average values of several cycles of monitoring variables and graphics. For all monitoring, a tolerance recommendation is automatically provided at the same time. In this manner, a mould-specific basic setting for the monitoring process may be quickly developed, which may then be refined.

### Selection Unit and Error Analysis

It is the task of the selection unit to separate good and defective parts from one another without requiring the Allrounder to be switched off. Error analysis ensures that the quality monitored machine parameters are documented whenever tolerances are exceeded. The machine will only be powered off when there is a specific overrun pre-set for an area, or for a general overrun of error messages.

### Process Documentation: Consistent Product Quality and Errors Become Visible

Documentation of process conditions makes not only the quality apparent, but also problems in production. Generally, the relevance of the selected machine variables is verified by a test series which can take place in the set-up phase of the machine. Testing takes place using logical parameters for quality monitoring.

Three different documentation protocols may be generated. These are an actual-value protocol, a production protocol, and a set-up protocol.

The production and set-up protocols also document changes in operation mode, alarm messages and process changes. Machine operators as well as inspectors can determine the product quality characteristics of the current batch clearly from the different protocols. They may also see where problems lie within production and in what area they are to be sought.

### Statistical Quality Monitoring with AQS

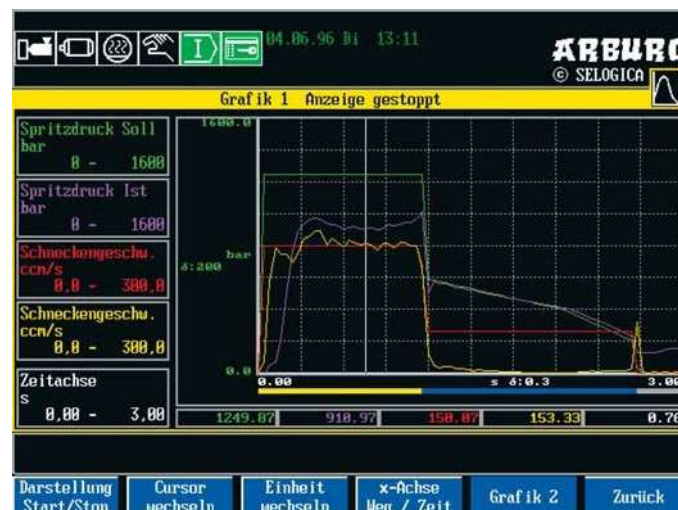
AQS expands process documentation by the addition of statistical monitoring capabilities. Along with the display

cal quality monitoring by AQS, quality monitoring may also be carried out using a “process model.” The AQC (ARBURG Quality Control) system derives the form-specific correlation between quality characteristics of the injected pieces and additional criteria which are calculated from process data. In an optimised work cycle, the relevant injection parameters are recorded, and random samples are taken and tested.

At the end of this analysis there are different formulas which demonstrate the relationship between quality characteristics and influencing variables. In other words:

- Determination of necessary mould corrections
- Quality characteristics and tolerances from technical drawings may be incorporated with the Selogica controls, which significantly eases quality monitoring for the machine operator
- The system determines the QS characteristics per shot as the basis for selecting rejected parts, thus making subsequent measurements of formed parts unnecessary and reducing production costs drastically
- The quality information is continuous and documented graphically
- AQC is fully supported by the Selogica control unit; an external device with a reduced range of functions is also available for the M and C series.

The calculated quality characteristics may be transmitted via the injection moulding machine by the AQC system for documentation, statistical evaluation or to ARBURG Quality Assurance or AQS for serviceability testing. With this, an advantageous variation for process documentation is made available.



### Digital Quality Monitoring

Complex procedures - simplified and clear

and evaluation of the actual values of selected monitoring variables in production, measurable as well as attributive quality characteristics of formed parts may also be analysed with AQS. For visualisation of these comprehensive quality monitoring procedures, options are available such as the creation of histograms, control cards, probability grids and event protocols.

AQS may be installed on all Allrounders with onscreen controls. Up to 16 machines may be monitored simultaneously on one system.

### AQC: Quality Monitoring by Process Model

As an expansion to statisti-

cal quality monitoring by AQS, the process models allow the calculation of formed part quality from the influencing variables during any cycle which is currently running. The “quality condition” of the currently produced injected part is reported back to the injection moulding machine by the AQC system.

The following features distinguish the AQS system:

- Significant cost savings through the limited extent of testing while achieving 100% monitoring
- Determination of the optimal injection parameters through a two-phase optimisation calculation

# The Swiss Branch Looks Back at Three Years of Success

At the beginning of 1994, ARBURG AG in Belp assumed the responsibility for business in the Swiss marketplace. 500 customers and 2,500 ARBURG machines which had been sold in Switzerland made the opening of an ARBURG company subsidiary a logical decision. The sudden sale of HATAG of Ostermundigen, which had represented ARBURG for more than 20 years in Switzerland up to that time, accelerated the step toward a new branch for the company.



The Administrative Team of the Swiss Branch

Today, the Swiss customer base has a solidly established and highly motivated team of 14 men and women available to it. Included in the team, along with Manager Peter Moser, are five other former employees of HATAG who were brought on board to take up their work in the newly-

patch, and four Service Engineers are always available with well-equipped vehicles for rapid deployment at the customer location. Ongoing training in Lossburg is a matter of course for the technicians.

In order to meet customer requirements when it comes

should occur that a part cannot be delivered immediately, then there is a direct computer link to warehouse inventories in Germany, England, France, Italy, Spain, or others.

Markus Stadelmann, Sales Manager for inside sales and two capable outside sales representatives, Aldo Ravedoni (West and Central Switzerland Region) and Jürg Steiner (East and Central Switzerland Region), handle sales responsibilities. During their many plant visits, they make it possible for their customers to receive consultation from experienced technical specialists and application engineers. Quick access to Lossburg has proven to be ideal for the Swiss customers, also because of the possibility for participation in the many training courses which are offered.

The administrative area is handled by Luciano Petri (Finances and Personnel), Petra Bichsel (Management Assis-



ARBURG in Belp

tant and contact for Sales Administration), and Franziska Jüsy (Receptionist and Secretary).

Despite today's difficult economic climate, the Swiss team has made it a goal to continue to build its position as the leader in the Swiss market for injection moulding technology by their commitment, and by acting and reacting in the best interests of the customers. The highly positive feedback from customers regarding the new S series has reinforced the Swiss branch in taking on this challenge.

This year again, the Swiss subsidiary will be represented at the ARBURG booth at the "Fakuma" in Friedrichshafen (October 14 - 18, 1997) which is considered to be one of the most important Trade Fairs for German-speaking customers in Switzerland.



ARBURG mobile: The service technicians

formed ARBURG branch.

The ARBURG demand for customer satisfaction and a perfectly functioning after-sales service organisation is also observed by the Swiss branch. And so Thomas Joerg, who is responsible for telephone "aid and comfort" for customers and for Service dis-

to quick availability of spare parts, there is a well-developed and constantly updated parts warehouse in Belp. The warehouse, which has approximately 3000 different spare parts at a value of 1.5 million Swiss Francs, is supervised by Andreas Haruksteiner. If it

The Efficiently-Designed Spare Parts Warehouse

