

STAMPER

MAGAZINE FOR HIGH PERFORMANCE STAMPING TECHNIQUE

■ SERVO-FEEDERS: RETROFIT THAT PAYS OFF.

With the introduction of servo-feeders BRUDERER provides an ideal solution that will increase productivity – even for the BSTAs of earlier years.

■ INNOVATIONS AROUND THE PRODUCTION PROCESS.

Interesting reports concerning the introduction of visual inspection cells, innovations around sound insulation, coating of stamped parts and in sourcing materials.

■ HÄRTER: WHEN THE HOBBY BECOMES A PROFESSION!

“The successfully practised policy of short communication paths and our marvellous and still growing team are indicators that things are continuing to move upwards”.

■ SERVO-MOTORS AS MAIN DRIVES: USE THE TECHNOLOGY OF THE FUTURE TODAY.

BRUDERER has prepared some interesting answers to the important questions concerning servo-technology.



Andy Fischer
Deputy Managing Director of BRUDERER AG

Dear customers and business partners

Over the past two years the STAMPER was able to establish itself as a valuable source of information in the stamping industry. To move along this thread, this edition offers you once again a mix of technical and technology information with relevant market and customer developments, thus sharing with you an insight into the BRUDERER activities.

Among various new developments in our industry the servo technology has been prominently displayed at the recent BlechEXPO in Stuttgart and certainly deserves major attention in the STAMPER. Two articles address the topic in this issue – in his analysis, Josef Hafner elaborates on the generic merits of this technology, whereas Daniel Troxler presents solutions on how existing BRUDERER machines can be upgraded.

With pride we also report on the official opening of our new competence center in China, the BRUDERER Machinery (Suzhou) Co., Ltd. After many months of preparation we are now operational near Shanghai and offer the same service that many of you have come to rely on over the years. Besides offering BRUDERER trained service personnel, we stock critical spare and wear parts and are now able to completely overhaul our machines locally.

More news comes from our business partners, such as the Härter Group demonstrating its capabilities and competences to a selected group of guests during an open house in May. Other articles are written by Wieland, Vester, Fahrer and Ingo Müller Surface Technology.

As you can see, this STAMPER edition offers you once again informative and inspiring reading material. Furthermore, we are of course still interested to keep up our direct communication with you – either by phone or e-mail, or even better in a personal discussion. Good opportunities for meeting with you will be the upcoming tradeshows, the StampingDays in Pforzheim from September 19 to 21 or the PRODUCTRONICA in Munich from November 13 to 16, 2007.

We are looking forward to your visit!

Andy Fischer

Opening ceremony of BRUDERER Machinery Suzhou



The official opening of our Competence Center in Suzhou, China was held in June 2007. The venue was a great opportunity to show our customers and guests the capabilities of our newest subsidiary in Asia as well as the latest machine model, the BSTA 200-60BE.

The two day event started with a traditional Chinese opening ceremony with speeches of our honourable guests, the Consul General of Switzerland, Mr. Frei and the Vice President of the Suzhou Industrial Park Authority, Ms. Sun. The ceremony had its highlights in the customary tiger dance and the official ribbon-cutting which symbolized the beginning of the operation of BRUDERER Machinery Suzhou.



The expectations of the invited guests were high as they were all eager to see the capabilities we offer in the latest daughter company of BRUDERER. Our competence centre is serving all customers in China with spare parts, technical support and, most importantly, it will function as an overhaul centre for pre-owned machines.

The importance of the competence centre is obvious, considering the fact that already more than 600 stamping presses are installed in mainland China. Many of those were transferred from other countries to China and hence are in an age, where an overhaul is a possible solution in order to increase quality and productivity again. One of the main targets was to show the technical capabilities on 3 exhibits which have been completely dismantled and overhauled in our Suzhou plant.

The event was also the platform to launch the new BSTA 200-60BE which was developed, based on customer surveys carried out all over the world, including some of the invited

guests at the open house in China. The input of our customer's requests for a high performance machine with great ease of operation for the manufacturing of small precision parts at a reasonable price was clearly visible with the two fully operational machines on display. One of the machines produced a complicated electronic contact with 1'800 spm with a double out progressive die.

The technical seminar in the afternoon of the first day was also welcomed by our visitors. Our guests were able to gain valuable insights in process related topics, carbide materials for tooling, peripheral equipment as well as the latest developments in copper strip material.



Consul General W. Frei during the tour through the new factory in Suzhou.

We welcomed a big number of guests from the greater Shanghai area and were able to achieve our goals to increase the awareness and confidence of our customers in our operation in Suzhou. The positive response to the newly launched BSTA 200-60BE and the confidence shown in us reassured us that we had made the right investment decision in setting up the new competence centre in China.

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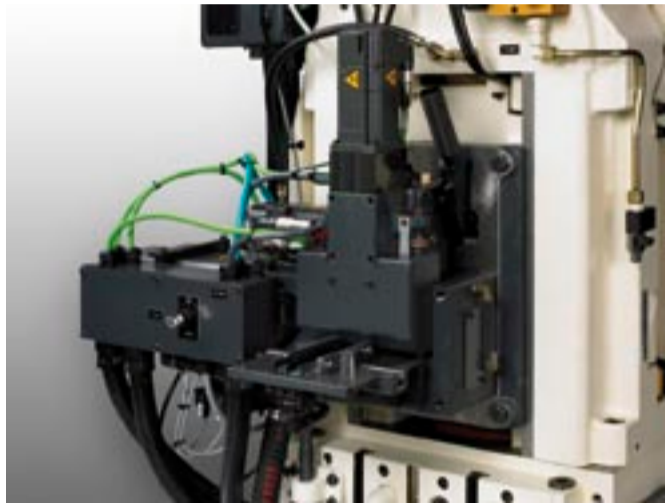
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Retrofit that pays off

Flexibility is nowadays an important factor in modern stamping shops. Furthermore, when stamping smaller series in order to reduce inventory, the retooling process creates higher costs due to lower output and productivity. By offering its servo feeders, BRUDERER presents a solution in order to increase efficiency, productivity and flexibility – even for old BSTA's.

The servo feed technology has been successfully introduced by BRUDERER about two years ago. Until today we have already sold more than 50 units for various applications. In the meantime we do not only offer the BSV 75, BSV 170 and BSV 300 for the use on new machines but also as retrofit solutions for operational BSTA's in the field.



BSV 170 attached to a BSTA 300.

Depending on the age of the machine and the existing control we offer the retrofit solution in two different versions. The first is the integrated solution and the second is the so called stand-alone version. The solution where the operation and programming is integrated into the machine control can only be offered for machines with B-control. The only restriction is the performance of the PC which has to be verified by means of the commission number of the machine. For all other machine types a stand-alone operating panel with touch display is used for the retrofit of the servo feeder.

The operation and programming of the stand-alone solution is convincing, even on older machine types. Feeder data can be programmed via the 5'7 inch colour touch screen. The material and feeder data are stored automatically in the memory of the BSV control for an automatic retooling process. Additionally the panel offers a state-of-the-art TDC control for the machine as well as 4 programmable cam outputs for the individual requirements of the customer. All of the above guarantees an easy handling and a trouble-free retooling of the feeder data for a higher productivity.

We have developed retrofit packages for most generations of machines and controls that BRUDERER ever built. With these kits we are able to define the required parts to be changed



Operation of the stand-alone feeders is clearly arranged and structured.

or altered quickly and easily. For example on an old machine with H-control, we supply 2 defined kits together with the BSV, which include the TDC control, the cam control and the operating panel. At the customers place, the service engineer just replaces the pre-assembled units, which reduces the time for the retrofit of the BSV to an absolute minimum.

The complete feed unit, including the drive motors, are not only lubricated but also cooled by the central lubrication system of the punching press according to the well proven BRUDERER standard. Among other benefits, this allows for achieving the high performance expected from our products while simultaneously reducing maintenance work to a minimum.

The retrofit of the latest servo feed technology from BRUDERER can increase the quality, productivity and flexibility on old machines which are long depreciated and hence increase the profitability of the system again.

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Delphi Neumarkt earns 2007 Government Award for Quality

In both national and international competition "quality" is an essential success factor for any company. This year the Bavarian State Ministry has once again awarded the Bavarian Quality Prize, which continues to enjoy high esteem since it was first awarded in 1993.



Accepted the prize: Johann Lang (Plant Manager), Klaus Angermeier (Head of Quality), Luigi Sorrentino (OP Manager EU), Stefaan Vandevelde (Vice President, Delphi Global).

A total of thirteen prize winners, including both Bavarian companies and also business-oriented local authorities, received their awards on 7th March at the Munich Residenz from Bavaria's Economics Minister, Erwin Huber. Ten prizes went to companies who had achieved outstanding performance in the field of company quality, and three prizes went to local authorities

who had distinguished themselves in terms of their business-oriented services.

"Today, more than ever, a comprehensive understanding of what is meant by quality is necessary to be able to remain successful in the marketplace. Superior products and excellent services only emerge if there is a demand for high quality standards. At the same time these standards form the basis for satisfied customers. The companies receiving the awards provide first-class examples of quality, quality management and customer orientation", declared Economics Minister Huber.

Delphi Connection Systems from Neumarkt/Oberpfalz received a prize for company quality in the industrial production companies sector. High precision contact parts for electrical components and complex connector systems for the car industry have been produced in Neumarkt since 1997.

Production takes place on state-of-the-art high performance automated stamping presses. Around 570 staff and 35 trainees produce future-proof, innovative and quality products on a production area of 15'000 square metres in Neumarkt. In recent years around 200 new jobs for qualified personnel have been generated.

The Delphi Manufacturing System has played a central role in this success. It features a clear orientation towards quality together with an ongoing process for continuous improvement. Delphi Neumarkt works with an excellent quality management system, in which orientation towards the customer and the marketplace takes centre-stage.

Around 200 million defect-free parts leave the factory per month. Since September 2001 the showcase operation has not received any customer complaints and has maintained a 0 parts per million defect rate.

The pursuit of quality and an exemplary performance are not only securing the future of the company in a difficult competitive environment, but are also mirrored in the imposing number of national and international awards that Delphi Neumarkt has received for its all-out quality offensive.

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HÄRTER: When the hobby becomes a profession!



In Königsbach-Stein, if you turn into the Gutenbergstrasse, you will soon find yourself at HÄRTER, the model Swabian company for toolmaking and stamping technologies that for years has been causing quite a sensation. Wolfgang Härter, the founder and head of the group of companies expanding across the world, for whom his job is at one and the same time his vocation, granted us an insight into his work and gave away a few secrets.

He did not make any secret of his recipe for success. "Close-ness to the customer is the alpha and omega. As a global provider of "one-stop shopping" solutions in the metal and components industries we must have a presence in the growth markets worldwide". The skilled toolmaker and professional optimist sees Germany as a great jumping off point for successfully gaining a foothold in Asia and the Eastern European countries. "It is absolutely essential to invest continuously in progressive technologies and the most modern means of production", continues the father of two.

Wolfgang Härter, who with body and soul enthusiastically exemplifies to his staff everyday his favourite motto "There's no such thing as 'can't be done'" sees the greatest challenge in today's market environment as that of guaranteeing maximum flexibility and innovation in all sectors. As a family company HÄRTER can be proud to be present alongside the large companies as a systems supplier in the global production network. "The successfully practised policy of short communication paths, our marvellous team that is still growing, the increasing number of training places – these are all indicators that things are continuing to move upwards", reports Wolfgang Härter.

As a systems supplier of stamped parts and complete metal-plastic components the company has been established for a long time near Pforzheim. More than 1'500 staff work worldwide to add further chapters to the success story. "A few days ago we were one of 47 companies worldwide to receive the Bosch Supplier Award for 2005/2006", enthused Wolfgang Härter, and added that in this way Bosch had particularly rewarded HÄRTER's performance in the creation and delivery of products and services.

Telecommunications and automotive manufacture are today the principal customers for HÄRTER's stamped parts. To these can be added precision parts for the electronics industry, for household appliances or for the watch industry. Here the holistic approach always takes centre stage. "From the first idea through to series production we always stay very close to our customers", says Wolfgang Härter.

Over 40 years of experience in toolmaking, the latest equipment and innovative ideas: these are the distinguishing features of HÄRTER products, and this is what makes it possible to meet customers' wishes quickly and flexibly, and to offer them customised technology solutions.

For stamping technology, BRUDERER has pride of place at HÄRTER. Alongside the investment costs, it is primarily the manufacturing costs per part and the value retention that are the reasons why the company owner will continue to rely on



Manufacturing of high-precision parts for the automotive industry: Once again, by using the BSTA 2500, HÄRTER has broken new ground in the production of complex and high-precision parts for the automotive industry. With this innovative solution, market requirements in terms of quality and efficiency can be met to the highest standard. Thanks to a corresponding tooling concept from HÄRTER, punched parts in some fields can now be manufactured more economically.



Wolfgang Härter – founder and managing director of the company.



Martin Härter – managing partner in the HÄRTER-Group.

BRUDERER machines for most applications in the future. In keeping with its long tradition, most recently HÄRTER has been carrying out some truly pioneering work by using the initially controversial drive concept of the servo-press. At first, servo-presses were used purely as workshop and testing presses, but recently the number of servo-presses also being used for samples, pilot production series, limited production runs and for smaller batch sizes has increased steadily. Everyone knows that to stand still means to go backwards, and so another new trend is already being developed. Stamping tools are becoming ever more complex to meet the demands of customers. The result of this is that the progressive tools are becoming larger, requiring an ever-longer opening of the stamping machines.

We may well wonder what challenge the people in Königsbach-Stein will set themselves next. One thing is already clear: if it's not available at HÄRTER in the future, then it probably can't be done.

First company exhibition for HÄRTER Werkzeugbau GmbH



Group photo with the Managers: (right) Wolfgang Härter, (left) Martin Härter, (centre) the managers of the plants in Albstadt-Ebingen, USA, China and Poland.

Under the slogan "Passion for Technology", HÄRTER Werkzeugbau GmbH, based in Königsbach-Stein, together with 14 of its key suppliers, organised its first company exhibition in the "Kulturhalle" in Remchingen.

Alexander Kasper, HÄRTER's head of marketing and organiser of the show, explains the concept: "The basic idea behind this event is to work with some of our strategic partners to provide an overview of tool-making, punching and plastic composites technology. We have built up a network with these companies and would like to further strengthen our constructive partnership and show people how it works. We see this show, together with specialist conferences and factory visits, as an ideal platform for knowledge transfer within the industry and as a service to the visitors, namely our customers".

The busy programme of events at the show was rounded off with talks by invited speakers about current challenges in the automotive and telecommunications markets, along with various interesting specialist lectures by high-ranking representatives of the exhibiting companies. About 800 visitors from all over Europe had signed up for this two-day HÄRTER show which won unanimous approval from visitors and exhibitors



Company executive Wolfgang Härter was congratulated by Königsbach-Stein's mayor Bernd Kielburger (second from right).

alike. All the companies which have something to do with making a punched component were gathered here. A few of them had been selected as strategic partners who could introduce their own companies at this show.

"They share the same passion for technology as ourselves", said Härter. It was Einstein who declared that progress thrives on the exchange of knowledge. "Our company show aims to provide you with an excellent platform for that purpose, and so I would like here to thank everyone involved who made that exchange possible and who worked hard to ensure that the show went so smoothly".



Making outstanding products requires consistent and uncompromising quality control at all stages of manufacture.



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P is for perfect partnership!

For more than 7 years the VESTER company has supplied inspection cells for quality inspection to KOSTAL Kontakt Systeme GmbH. Today's requirements on the manufacturer of contacts are becoming ever more comprehensive with regard to tolerances and seamless tracking of the production processes. 100 % parts inspection is essential. Simple operability, reliability and ease of servicing are the three trump cards held by the VESTER VIDEOcheck VVC 600 inspection cell.

In the marketplace the name KOSTAL Kontakt Systeme GmbH is synonymous with quality and capability, when one is talking about stamped contacts and complete solutions for the automotive industry. As a company with 580 staff it is integrated into the KOSTAL Group founded in 1912. Today a total of more than 10'700 staff work for KOSTAL in 14 countries.



Mr. Wießner, Head of the Stamping Shop and Mr. Rockoff, Deputy Head of the Stamping Shop at KOSTAL Kontakt Systeme, at a VESTER VVC 600 inspection cell. Geometry and dimensional stability of the parts are measured and displayed with an accuracy of < 0.02 mm.

In the car sector in particular the requirements on tolerances and traceability of the production processes continue to increase. The introduction of visual inspection cells is therefore no longer something to be dismissed. Christoph Diepold, Manager of Component Engineering at KOSTAL Kontakt Systeme, sees the reasons for this not only in the reduction of consequential costs arising as a result of idle times in downstream installation processes, but also in the seamless traceability of complete production batches and in the exclusion of sporadic defects. A particularly sensitive point is the occurrence of sporadic defects in contacts, which can lead to considerable problems with the end customer. Just one defective part can result in the customer sending back a complete delivery.

At KOSTAL Kontakt Systeme the VVC 600 inspection cells have not only convinced the policy makers, but also the staff of the

stamping shop, who are integrated into the decision process. Their opinion is often crucial. In the case of new acquisitions, test units from various suppliers are often installed and evaluated by the operators.

The company VESTER Elektronik GmbH partners many well-known users in the stamping industry in the field of measurement technology and process monitoring. As a special service the customers are also offered contract sorting including either a 100 % quality check or only a batch assessment.



VIDEOcheck VVC 600 stamped parts inspection cell in conjunction with a patented LASERmark VLM 600 laser inscription cell for 100 % inspection and inscription/coding of continuous stamped parts.

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Fahrer Schallschutztechnik AG

At the end of the 1980s, the long-established panel-beating and metalworking business Fahrer received a request from a well-known Swiss watchmaking company to develop an efficient yet compact and practical machine inclosure. The small team of metalworkers gladly accepted this challenge and soon produced a prototype. The test results were astonishing right from the start, and resulted in a large order from the watchmakers.

This was just the start. Today, all that company's punching machines are insulated by MASTER cabins from Fahrer. 1993 saw the foundation of Fahrer Schallschutztechnik AG. Just two years later it moved into urgently needed new manufacturing premises. Within a very short time, the company had successfully established itself on the European market as a leading specialist company for industrial soundproofing.

Two design principles are responsible for this success: the soundproof cabins in the MASTER range, which are manufactured specifically to suit customer requirements according to their own design principles or even as one-off, custom-built units, and the standardised soundproof cabins of the ECONOMY range which are built on a modular principle and come in a number of standard sizes. Because of the modular construction of the ECONOMY cabins, self-assembly is an option.

Products

Soundproof cabins, covers and walls, tape sliders, roller cages, punching trolleys.

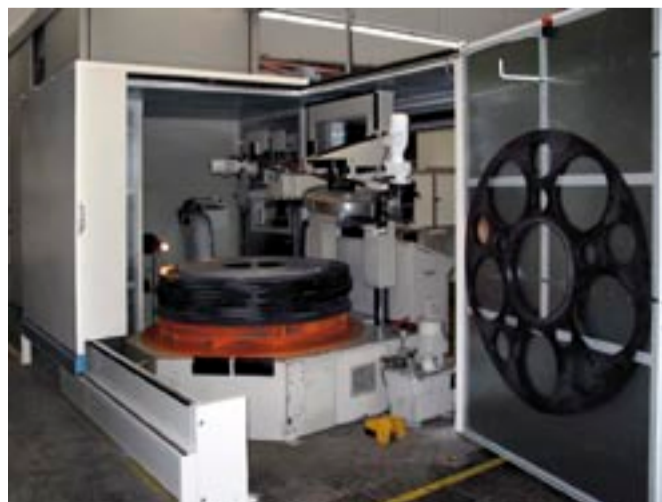
Specialist areas

All Fahrer soundproof cabins are designed in close cooperation with the machine manufacturer. All key aspects regarding openings, ventilation as well as pipe and cable lengths are discussed well in advance.

Fahrer's other services include

- Evaluation, Design, CAD-Layout
- Construction and manufacturing
- CE-compliant designs and fittings
- Special designs for peripheral equipment
- Assembly and maintenance

In this field, the tasks are becoming ever more complex. Working closely with the customer, Fahrer always tries to meet as many of the requirements as it possibly can, to guarantee maximum success. The following pictures highlight the innovative skills of the company.



This special soundproof cabin has been developed and built for situations where access is difficult. As shown on the picture, the side and roof sections can be opened at the same time.



Soundproof cabin, complete with interior lighting, compressed air supply and ventilation, tailor-made for each particular machine.

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IMO Oberflächentechnik GmbH: New standards in the electroplating of stamped parts

The combination of reel-to-reel plating and single-part plating confers on IMO Oberflächentechnik GmbH a unique position in Europe. The company, which was founded in 1973, specialises in the electroplating of precision parts for the automotive industry, electrical engineering, telecommunications and medical engineering, and at the present time employs more than 300 staff at its Königsbach site.

In the manufacture of contacts, IMO's reel-to-reel plating represents the next logical step in the process chain after the stamping process using high-performance presses. On 29 strip facilities special technical procedures are used for the electroplating of solid and stamped strips to meet customer requirements. These include the selective immersion method, selective wheel technology, brush and spot technology as well as the new, patented MPP method.

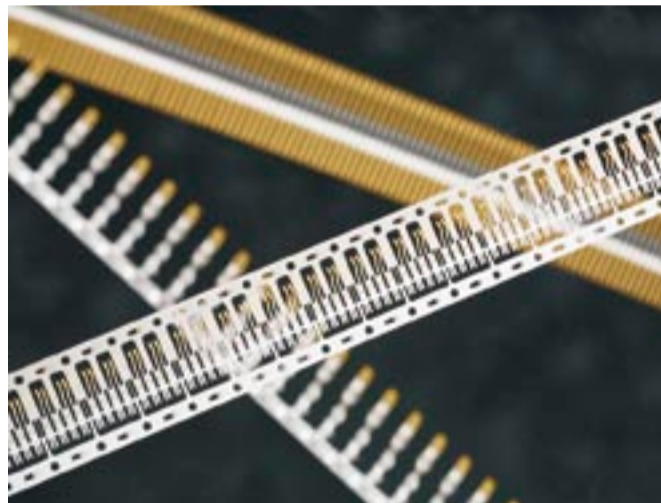
Electroplating of single parts has also been successively further extended. Today IMO possesses three very modern fully automatic machines for drum, rack and vibration technology. The advantages lie in particular in the short delivery times

achieved as a result of accelerated throughput, expanded capacities, flexibility and optimisation of quality.

The production facilities have been developed by the subsidiary MSA GmbH and represent state-of-the-art technology. Gold, silver palladium, tin, copper, nickel, nickel-phosphorus and multi-layer systems are offered as surface coatings. In-house coatings such as IMOLOY and AURONIP are also available.

Ever since the company has been in existence it has supported the customers' legitimate requirements regarding product safety and environmental sustainability. In close collaboration with its customers the company is putting into practice a modern and integrated management system in accordance with the requirements of ISO 9001 und ISO/TS 16949. With the introduction of an environmental management system in accordance with ISO 14001 and EMAS IMO has committed itself to continuous environmental protection activities, something that has been marked with the recognition gained when competing for the environmental prize for companies in the state of Baden-Württemberg.

The company's most important objectives, now as before, are to offer to the customers the best quality at optimal prices, and, at the same time, service at the highest level. To satisfy future requirements also a 6'500 m² production facility extension was completed at the Königsbach site in July 2007, and in China a separate factory for IMO Electronic Components (Changzhou), Co. Ltd. was opened in March 2007.



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Strip from Wieland: Good source material for low production costs

For cost effective production, any disruption to the operating sequence must be avoided. BRUDERER automated stamping presses and the high quality reels of copper and copper alloy strip from Wieland that are processed on these are the best guarantees for an operating sequence without any disruptions.

The stamping plant profits from this in two respects:

- throughput increases, and costs per part reduce.
- planning reliability increases, as does planned performance and thus capacity.

The Wieland Company is one of the world's leading suppliers of copper and copper alloy source materials. It will once again be showing its range of electrical engineering strip and wire at the Productronica fair from 13th to 16th November in Munich, in Hall B3, stand 342.

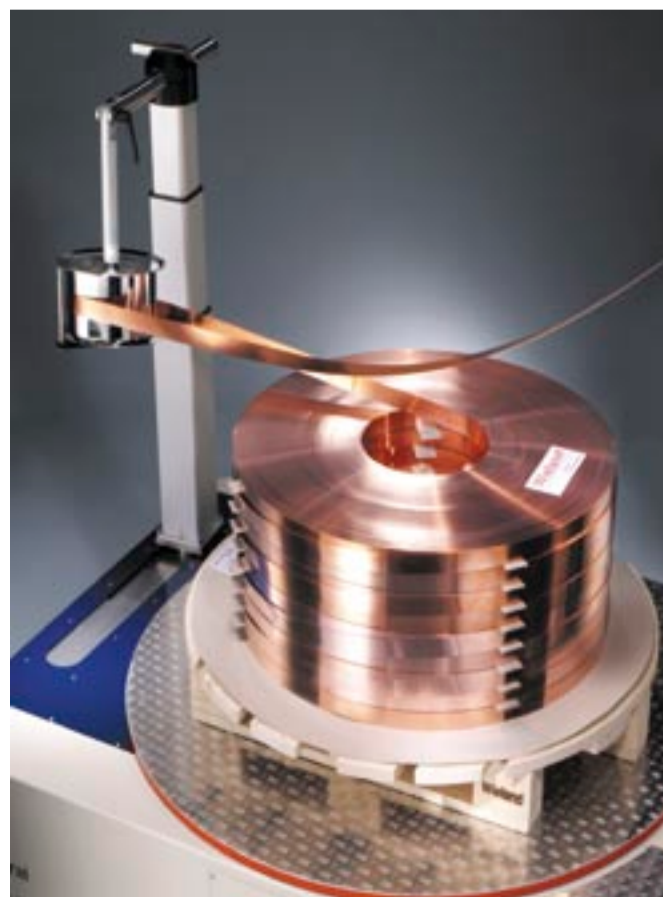
Alongside other products the Wieland-MULTICOIL® will be on display. In this design the rings are connected with one another such that the total ring stack forms an uninterrupted conductor. A complete pallet can be processed during a single stamping procedure. The Wieland-MULTICOIL® is thus the delivery format that enables stamping plants to implement a particularly rationalised form of production.

The zero defects principle pays off here too, because the presupposition must be that no malfunctions will occur during the stamping process. Thus the plants can work at fuller capacity, the costs per part can reduce and the capacity planned can increase.

The Wieland-MULTICOIL® is offered in strip thicknesses up to 1.2 mm and strip widths up to 60 mm. Here the exact conductor length depends on the allowable weight of the pallet, which

depends on the customer's circumstances – a maximum of five tons is possible. With strip dimensions of 0.2 x 30 mm this would be almost 100 km in length.

Quality, which pays for itself, also means, however, that the optimal copper alloy should be used for the application in question. Thus electromechanical components are becoming more and more miniaturised, and in order to avoid loss of properties, better performance alloys must be specified.



The most current examples of these are the high performance alloys Wieland-K88 and Wieland-K57. These have high mechanical strength with good electrical conductivity and very good malleability. These are the most important requirements for miniaturised electromechanical components.

You will find stamping and source materials at the same PRODUCTRONICA fair in Munich in Halls B3 and B6. Both BRUDERER and Wieland look forward to your visit

Wieland

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Servo motors as main drives: Using the technology of tomorrow – today.

At a time when the pace of technological change is stepping up massively year on year, engineering companies that are accustomed to success cannot ignore servo technology. BRUDERER has some interesting answers ready for the key questions in this context.

To what extent has BRUDERER taken an interest in servo technology recently?

BRUDERER reacted quickly to the emerging trend. In the last few years we have brought to market three models of the **BSV servo feed unit**, where the feed motion is synchronised to the angle of the crankshaft of the punching machine. Since we are not the pioneers in this field, we were able to avoid the teething problems that some of our competitors had to cope with. In the past two years we made good experience by using standard electric motors and our own mechanical in-house developments, which have been registered for international patents or in some cases, the patents are already granted.

We are also already familiar with the behaviour of **presses** with servo drives of all kinds. In 2004, we accepted an invitation from the **IMTMA*** to go to India and gave talks in Bombay and Delhi, analysing the use of servo presses in conjunction with high-performance punching units. In fact, for punching at high stroke rates, the new technology cannot be recommended unreservedly.

* IMTMA: Indian Machine Tool Manufacturer's Association

What types of servo press are familiar to us at present?

The various servo presses are based to a greater or lesser extent on the original drive technology, the mechanical crank press with flywheel. The most similar are the **servo presses with flywheel**. Here, a servo drive with a clutch is added to the complete range of functions of a mechanical crank press with flywheel and drive motor. The press operates as a normal mechanical press during the punching process. The servo motor is only switched on during the idling times, in order to bring the drive mechanism up to a higher rotational speed and then to slow it down to the original speed before the next work cycle. The most widely used version is the **servo press with no flywheel or clutch**. There are manufacturers of presses who offer all of their products with either normal drives or servo motors. Two German press makers have developed special machines with servo drive, with the larger of the two offering a complete series comprising five tonnages between 2500 and 6300 kN. The next two types of machine can no longer be described as typical presses, because the available power released at the BDC is quite different. The first of them are the so-called

spindle presses, which we have so far seen in one-, two- or four-spindle versions. The second of them are the so-called force-displacement systems which are also available from various manufacturers in Europe and Asia, where the rams are directly driven by **linear motors**.

Where are the best market opportunities for servo presses?

Since, for simple shear cutting, the results get better as the cutting speed increases, all servo presses can be used particularly successfully in **forming processes** where a slower speed is preferable. As a rule, the maximum stroke rates of these machines vary in a narrow range around **100 min⁻¹** or even less, where the BSTA performance range is only just beginning.

Especially for older, existing tools, the rule is: the maximum forming speed for the part is dictating the stroke rate of the conventional press. With the servo motor, valuable time can be saved in the "dead" angle of the rotation around TDC, and more parts can be produced per shift, without having to change any of the process parameters. Logically, this often applies to more high-tonnage machines, which tend to have very long strokes. In the case of the German manufacturer already referred to, this means 2500 to 6300 kN, with maximum strokes of 250 to 400 millimetres and maximum rotational speeds of 110 min⁻¹ with two torque motors.

With spindle presses, we see their benefits as trial presses, providing reassurance on the first runs of complicated tools. For fine adjustments, however, the final production press should be used. A press with linear motors is also described as a force-displacement machine. Its special area of application is in assembly work, for example for monitoring or recording compression forces. For a press in the traditional sense, the available force from these machines, of only 2 to 4 tonnes, is generally far too little.

What type of servo press do we currently see as the most promising version?

If a servo press is considered to be successful if it operates as similar as possible to a mechanical crank press that we are already used to, then the servo press with flywheel and clutch would be the first choice. It meets all the main criteria for economical and successful punching as with the servo motor, an attempt is made to keep the time when no punching takes place down to a minimum. Servo presses which work without a clutch or flywheel have to have a powerful servo motor with

the right torque to handle the process in question. If that is the case, then they are just as suitable as the above mentioned presses with flywheel. Machines with spindle-driven rams are very suitable as test or running-in presses for new tools, and there are a great many other special applications where their use can be justified. Stopping a process, to inject plastic (overmoulding) or the like, is also possible with a servo press with no clutch or flywheel.

Linear motor machines no longer bear much resemblance to presses in the traditional sense. However, if you have to assemble something in a controlled way using relatively little force, then they will probably do the job. In the past, that was also done by using pneumatic components, but the results were not seen as representing any real competition for punching machines.

What plans does the BAG have for servo technology in the future?

BRUDERER has begun to be involved with this technology with its **servo feed units**. The aim can only be to try to achieve a leading market position with these, too, and to maintain it over the years. To do that, above all we must keep up with the latest developments on the control side, and gain a technological advantage for ourselves.

The situation with servo presses is a little different. The so-called link motion presses, which generally cause their rams to oscillate by a type of knuckle joint drive, were supposed to have advantages for the bending and deep drawing process because of their **corrected ram motion curves**. This can be the case, but only up to a stroke speed of max. 100 min⁻¹ and a stroke length of min. 100 mm. Such presses are not included in our product range. True forming presses generally have strokes of far more than 100 mm. Servo presses also allow these corrected curves, but the programming options are far more flexible than with the mechanical knuckle joint drive, which generally has a set pattern for each stroke.

Since, on the one hand, we are not at present producing special forming presses, and, on the other, the corrected displacement curves are of no benefit in our higher speed ranges, we have so far refrained from offering presses with servo motors. Nevertheless, we have always kept a close eye on technological developments in our markets and we will continue to do so. That is to say, we will monitor developments and keep all our options open.

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