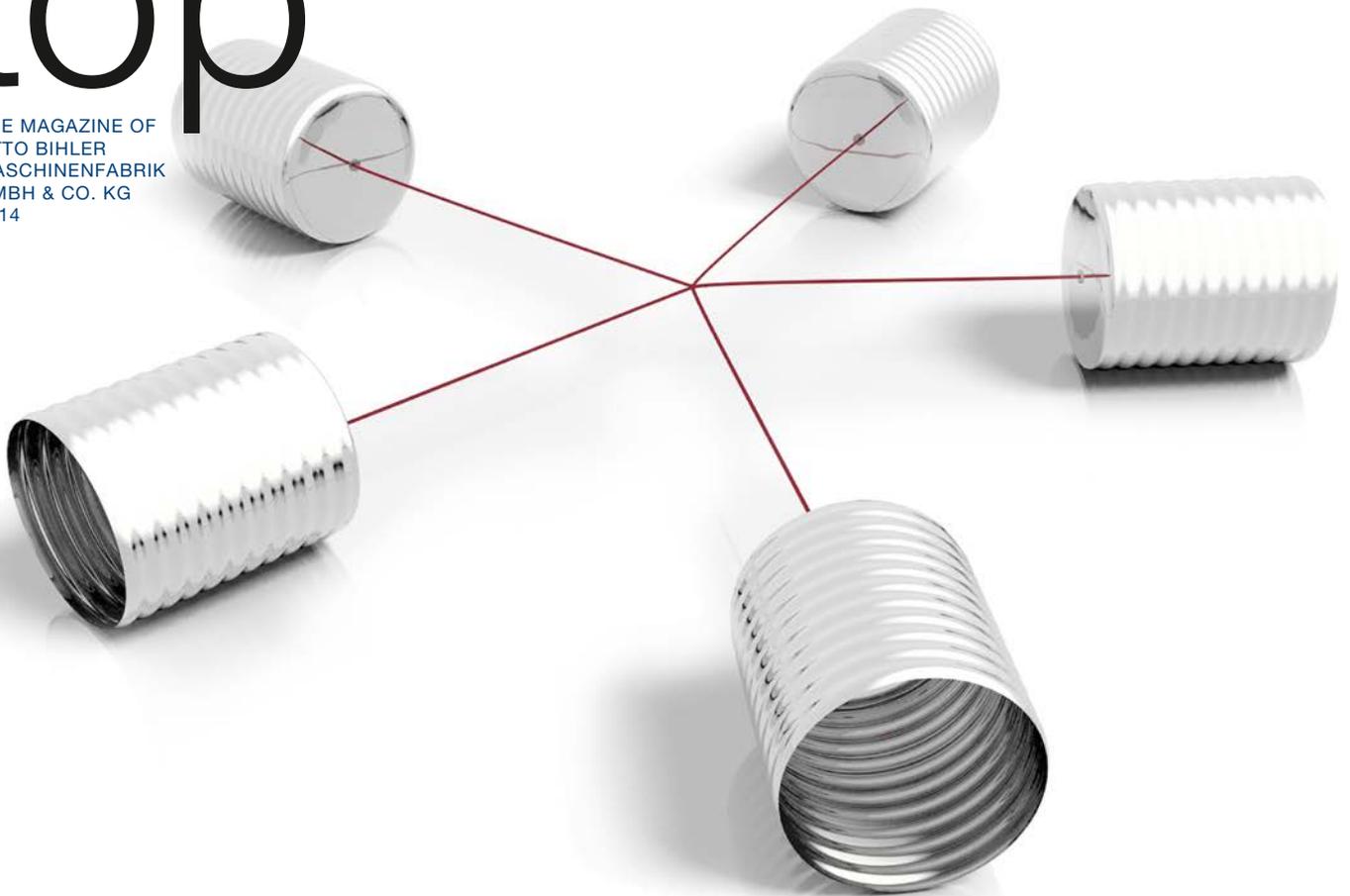


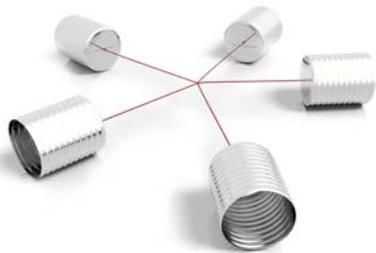
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THE MAGAZINE OF  
OTTO BIHLER  
MASCHINENFABRIK  
GMBH & CO. KG  
2014



**NETWORKED WITH THE FUTURE – INDUSTRY 4.0**



◀ About the cover photo

Overarching digital networking is one of the vital prerequisites for the success of the fourth industrial revolution (Industry 4.0). As a result, the Internet of Things and Services can network machines, storage systems and production equipment to form intelligent systems which will open up enormous potential for innovation.

b. on top  
The magazine of  
Otto Bihler Maschinenfabrik  
GmbH & Co. KG

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Dear readers,

The Internet of Things and Services is beginning to permeate our world and signals the start of a new age. And even though the fully networked, digital world already determines our everyday activities and the way we live and work, the most significant consequences of this new epoch will only gradually become clear over the coming years. This is particularly true in the case of industrial production. The manufacturing of the future will be considerably more flexible and efficient than in the past. Globally networked enterprises and production



systems will permit absolutely precise, customized and optimized production planning in all areas and will replace existing structures and workflows. We are therefore witnessing the dawn of the next, the fourth, industrial revolution. Known as Industry 4.0, it follows the initial mechanization and then the electrification and finally the computerization of industry.

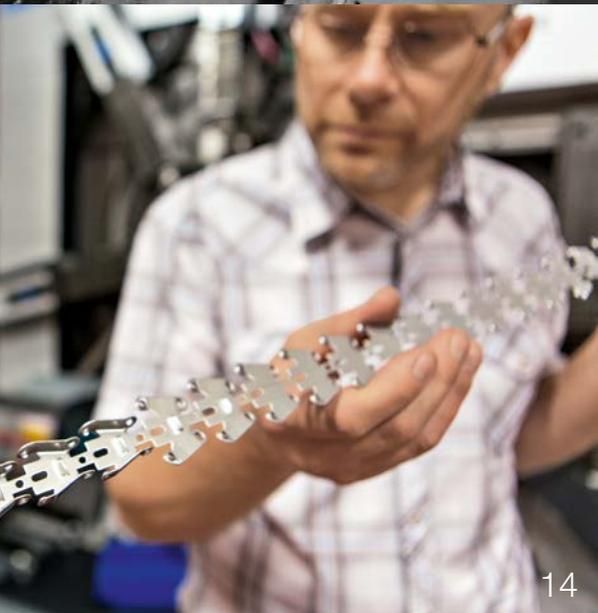
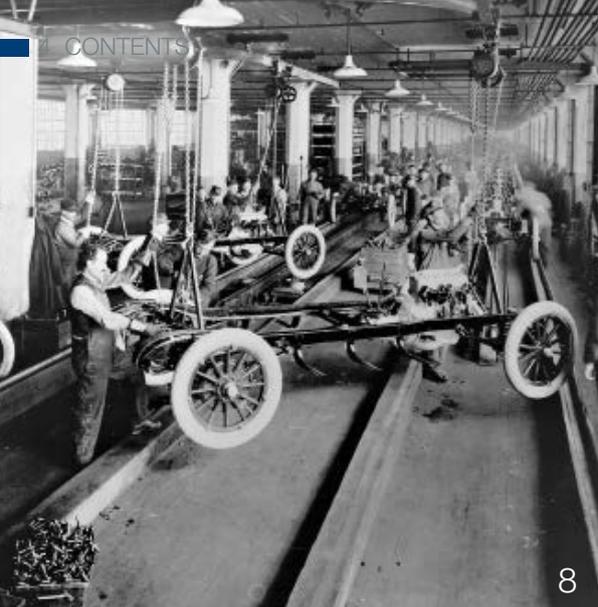
The path to Industry 4.0 will be an evolutionary process. It will make more efficient production sequences possible. Existing manufacturing technologies and acquired experiences now have to be adapted to the production capabilities of tomorrow. At the same time, it will be necessary to discover innovative new solutions for new markets. Industry 4.0 is therefore the key to ensuring our leading role in

industry and to reinforcing our competitiveness at the international level.

In the current edition of *b. on top*, we want to show you the potential that Industry 4.0 offers and how you can successfully exploit it using our machines and system technology. Intelligent control technology in the form of our VariControl VC 1 control platform is a crucial part of it – just as much as our efficient process monitoring or fully-networked remote service capability. Ongoing research ventures in cooperation with our customers, such as the InKonMass project for the inline manufacture of contacts (page 44) or the development of a self-correcting tool (page 31) also demonstrate our continuous commitment to innovation and further development. All our solutions and projects pursue one aim: to optimize manufacturing efficiency in your factory, to durably enhance your value-added processes and to strengthen your all-round competitiveness.

Continue to place your trust in our systems and technologies in the future and we can work together to take full advantage of the fourth industrial revolution. I hope you find the current edition both enjoyable and inspiring.

Mathias Bihler  
Partner and Managing Director



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## PHOTOVOLTAIC INSTALLATION ON STREAM IN FÜSSEN

## GREEN ENERGY FROM THE ROOF



The photovoltaic system installed on the roof of Bihler's Füssen plant has been operating since August 2013. The installation consists of a total of 2,751 German-built solar modules and covers an area of more than 4,500 square meters. This makes the system, which was installed by local enterprises, the largest solar power plant for in-house consumption in the Allgäu and also makes an important contribution to climate protection and the successful transition to new energy sources. The installation in its final form supplies approximately 700,000 kilowatt hours of electricity per year, equal to the consumption of some 190 households. "At peak times, we supply up to 80% of our needs ourselves," says plant manager Richard Hertl with satisfaction. "The rest is fed into the public electricity grid." Thanks to this system, Bihler saves the equivalent of 385 tonnes of CO<sub>2</sub> per year.

This makes operations at the factory 39 percent CO<sub>2</sub>-neutral.

## A pioneer in real-life sustainability

In this way, Otto Bihler Maschinenfabrik is putting the principle of sustainability into practice – to great effect. At the same time, the company is further expanding its pioneering role in the fields of ecology and environmental protection. Consequently, Bihler is investing in three more sustainable new systems in the form of a cogeneration unit, a ventilation and extraction system, and a compressor system. What is more, the installation of the photovoltaic system closes a circle. Because Bihler is itself very closely involved in the field of solar technology where one of its customers has long been using a Bihler MC 120 to manufacture vast quantities of fixing hooks for photovoltaic installations. ■

## LOGISTICS

## BIHLER AS A "KNOWN CONSIGNOR"



Peter Erd, Head of Dispatching and airfreight security officer at Bihler, in the restricted access security area.

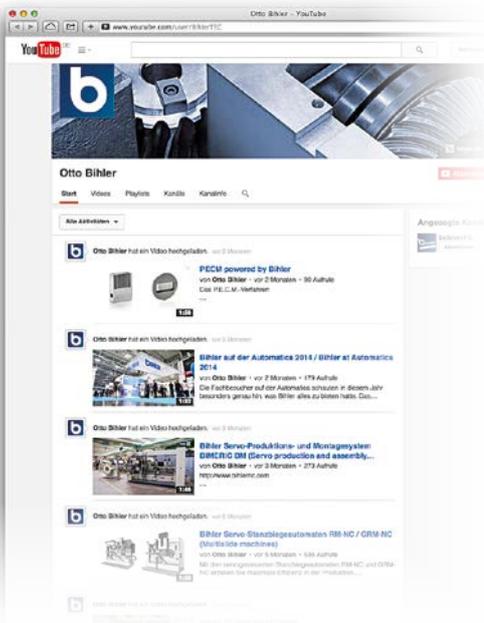
Otto Bihler Maschinenfabrik has recently been certified as a "known consignor". This status is conferred by the German Federal Aviation Office on validated companies, which are then able to dispatch their goods as secure airfreight. Enterprises with this certification no longer have to undergo time-consuming verifications and cargo approvals by third-party companies. For Bihler's customers, this means: Thanks to this new status, customers can now be supplied with original Bihler spare parts even faster. In this way, Bihler has once again significantly optimized the already excellent delivery times of its outstanding logistics and supply organization.

## Secure supply chain

"This new status guarantees that we can ship goods as airfreight as part of a 'secure supply chain' without delivery delays or any additional costs," says Peter Erd, Head of Dispatching and airfreight security officer at Bihler. "At the same time, we ensure that our transport partners possess approval as 'regulated agents' since this is another prerequisite for secure supply chains as set out in the EU Regulation. Ultimately, this approval greatly simplifies and shortens the shipment process for airfreight from the dispatch point through to loading in the airplane. That is an advantage for Bihler as well as for our customers ■

ALWAYS INFORMED

# BIHLER ON YOUTUBE AND TWITTER



Otto Bihler Maschinenfabrik is also in tune with the times when it comes to the question of social media. Under the title “BihlerTEC”, Bihler provides visitors to its YouTube channel with extensive, detailed information about its most recent services and products. This includes presentations, for example about the world’s fastest servo-controlled stamping-forming machines, the extremely versatile solution platform for a thousand or more tasks, and the most powerful welding system for sequential production operations. Take a look. It’s worth it!

**Tweet with us!**

Bihler is also present on twitter. Why don't you become a follower and keep up with the world of Bihler as it happens? Here you can also always find information on current events such as EuroBLECH 2014. ■



OPTIMIZED FOR SERVO-TECHNOLOGY

## NOW AVAILABLE: BNX8+ SOFTWARE

With version bNX8+, Bihler has further developed its proven technology software. The new version has been conceived with Bihler’s servo-technology in mind and provides users with optimum support during the design and development of corresponding Bihler tools – for minimized development times, considerably reduced development costs, optimized products and functionally reliable tools with longer service lives.

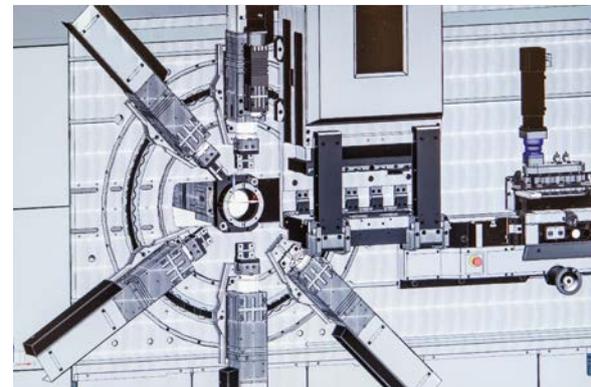
**New version  
with enhanced functionality**

“Using simple computation programs, existing function charts can be converted for the new servo-controlled machines extremely quickly,” says Peter Bertling, Head of CAx at Bihler. “To make this possible, we have ex-

tended the system for selecting 3D standard specifications with new machine components.” This means, for example, that users can set up the GRM-NC servo-controlled stamping-forming machine in an existing bNX environment extremely quickly. Thanks to a direct interface to the “Kinematics” module, it is also possible to read computed characteristic values directly into existing function charts. These values can also be output to the machine controller. In addition, further improvements and new developments have been implemented in the “Tool Layout” module.

**bNX9 at EuroBLECH 2014**

And development is still continuing: Thus Bihler will present the beta version of bNX9 for the first time at



EuroBLECH 2014. This provides new functions and innovative NC configuration calculations using e-tools and function charts. One new capability consists of the simulations and animations made possible in the “Cutting Tool Concept” application. ■

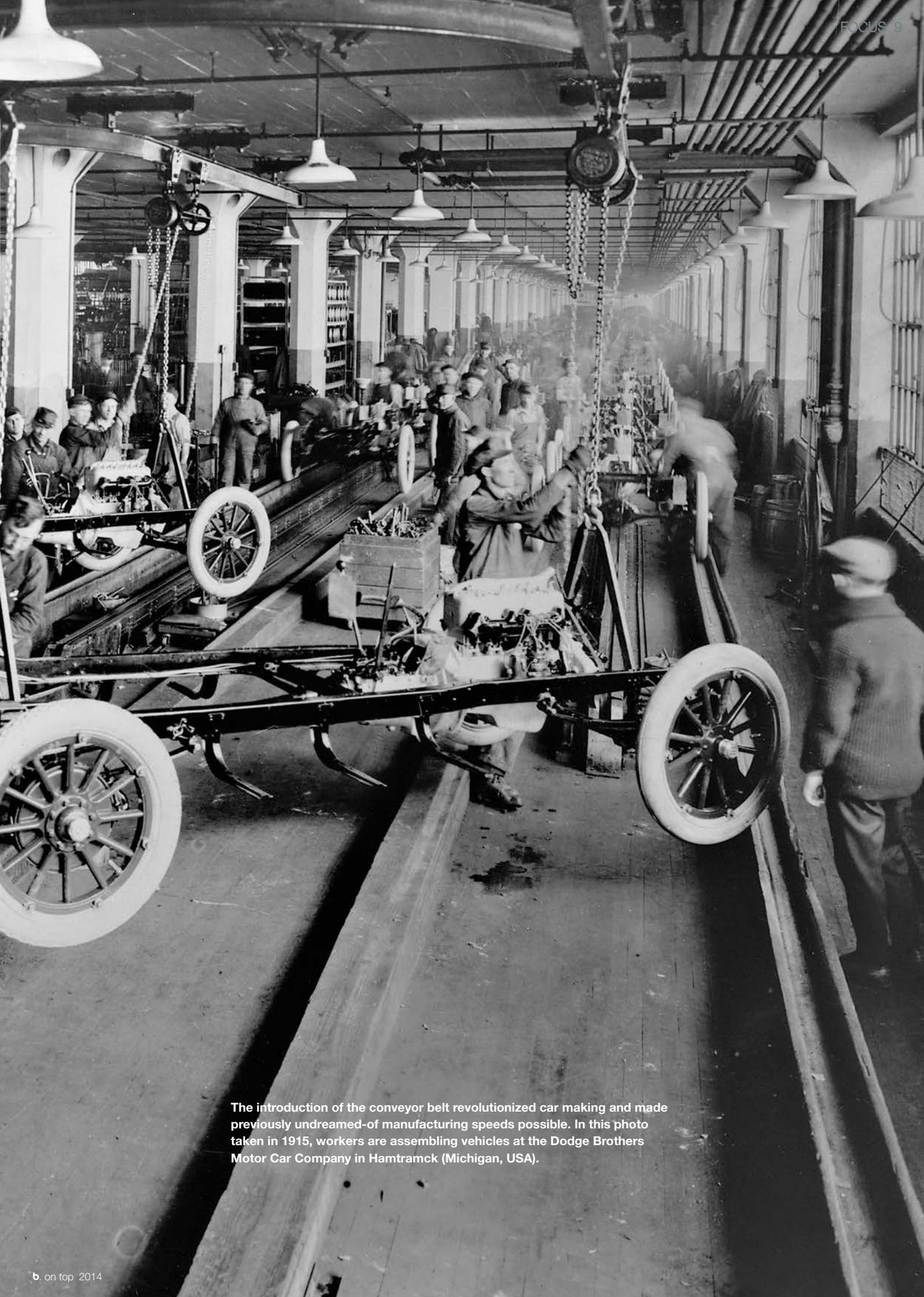
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# REVOLUTIONIZING PRODUCTION TECHNOLOGIES





The introduction of the conveyor belt revolutionized car making and made previously undreamed-of manufacturing speeds possible. In this photo taken in 1915, workers are assembling vehicles at the Dodge Brothers Motor Car Company in Hamtramck (Michigan, USA).

ON THE PATH TO THE FOURTH INDUSTRIAL AGE

# EXPERIENCE INDUSTRY 4.0

In today's networked factories, fully-automated production is controlled at the touch of a button. All the vehicle data is permanently available and permits custom configurations, as shown here in VW's fully-glazed factory in Dresden.



Under the name Industry 4.0, the fourth industrial revolution is ushering in a new age, in particular in the field of production technology. As a result, the Internet of Things and Services is networking machines, storage systems and production equipment to form Cyber-Physical Systems (CPS) which will open up enormous potential for innovation in smart factories. And Otto Bihler Maschinenfabrik is already demonstrating how the fourth industrial revolution can be successfully harnessed in practice – with intelligent control technology, efficient process monitoring and a fully-networked remote service capability.

Germany is one of the most competitive industrial locations in the world and also a leading supplier of factory equipment. This is due to the fact that the country specializes in the researching, development and manufacture of innovative production technologies as well as on ways to control complex industrial processes. However, the competitive context facing German enterprises today is becoming increasingly dynamic. It is, in particular, the increasing complexity of products and processes, combined with the problem of market volatility and constantly shortening product, market, technology and innovation cycles, that represent an ongoing challenge for German businesses. High raw materials prices and the already identifiable consequences of demographic change are further exacerbating the competitive situation of German companies. Despite this, Germany's strong mechanical and plant engineering sector, IT skills and expertise in the world of embedded systems and automation technology place it in an ideal position to further extend its leadership, in particular in the field of production technology. And the future looks extremely promising, because Germany is now standing on the threshold of the next industrial revolution, Industry 4.0.

#### Networking of products and processes

Following the mechanization, electrification and computerization of industry, the entry of the Internet of Things and Services in the factory environment is ushering in the fourth industrial revolution. Industry 4.0 stands for the intelligent net-

working of products and processes in the field of industrial value-added. This intelligence is making it possible to generate value added through new or more efficient processes and by creating higher-quality products and new services associated with these products. In the production field, machines, storage systems and operating equipment will, in the future, be globally networked within Cyber-Physical Systems (CPS). All the components of this network will be able to communicate independently with one another, act independently and reciprocally control one another. Thanks to the technical integration of CPS in production and logistics, as well as the implementation of the Internet of Things and Services in industrial processes, the potentials that exist in the fields of production, engineering, materials utilization, as well as supply chain and lifecycle management can be successfully identified and exploited.

#### Long-term value-added

And the potential of the new industrial age is enormous, as a current study by the Federal Association for Information Technology, Telecommunications and New Media (BITKOM) and the Fraunhofer Institute for Industrial Engineering (IAO) shows. According to this study, six sectors – mechanical and plant engineering, electronic engineering, automotive construction, the chemical industry, agriculture, and information and communication technology – alone will enjoy additional growth potential of 78 billion euros (annual growth of 1.7 percent) through to 2025 thanks to the use of Industry 4.0 technologies. In the

mechanical and plant engineering, in particular, additional growth potential of 23 billion euros (2.2 percent per year up to 2025) is expected. Here, the greatest potential lies in the networked use of operating, status and environmental data for the design of improved solutions, as well as in the implementation of intuitive operating concepts and simple configuration activities.

### New smart factories

The advent of Industry 4.0 technologies is bringing about the rise of smart factories running efficient processes. Thus their smart products are always uniquely identifiable and locatable, while also containing all the information relating to their complete manufacturing process. The embedded production systems are vertically networked with the economic processes at work in factories and enterprises and horizontally linked to distributed value-added networks which can be controlled in real time. As a result, it is possible to monitor and control, with pinpoint accuracy, the entire lifecycle together with the corresponding production systems, from receipt of order through to dispatch logistics. It is therefore possible to take account of individual customer requirements and even to manufacture one-off items profitably. At the same time, Industry 4.0 permits the dynamic design of business and engineering processes. As a result, production can be modified at short notice in order to react flexibly to malfunctions and resource downtimes. Production activities remain transparent at all times, optimize decision-making and even permit completely new forms of value-added business models. Such scenarios are particularly promising for start-ups and small businesses.

### A boost for technology, humans and organization

As in the case of the industrial revolutions of the past, however, the impact of Industry 4.0 technologies will not, at the outset, be revolutionary. Instead, they will gradually change industry in an evolutionary way over the coming years. However, Industry 4.0 must not be re-

stricted to technological aspects alone. Instead, the widespread introduction of state-of-the-art IT and smart production processes demands a holistic view of the entire system consisting of technology, human beings and organization. Industry 4.0 can help overcome current challenges. As a result, productivity and efficiency as a function of resource utilization will continuously improve across the entire value-added network as Industry 4.0 develops. It will be possible to structure employment in a way that takes account of demographic and social needs in the light of demographic change. Intelligent assistance systems will allow employees to focus on creative activities that generate value and free them from routine tasks. Given the impending threat of a lack of skilled labor, this approach can help maintain the productivity of older employees throughout an extended working life. Last but not least, the flexible organization of work will allow employees to better combine their professional and private lives as well as their ongoing training and improve the work-life balance.

### Industry 4.0 at Bihler

To take full advantage of the fourth industrial revolution, everyone involved must cooperate to ensure that the potential made available by

the Internet of Things and Services can be profitably used by industry. The task is to merge the existing knowledge and technological expertise with modern information and communication technologies and ensure their wide-ranging use. At the same time, the intensive research and development of innovative solutions for new business areas and markets will also be necessary.

In many areas, Otto Bihler Maschinenfabrik is already showing how the fourth industrial revolution can be successfully put into practice today. "The intensive interaction between human and machine will increasingly become the decisive criterion for enhanced efficiency in production.

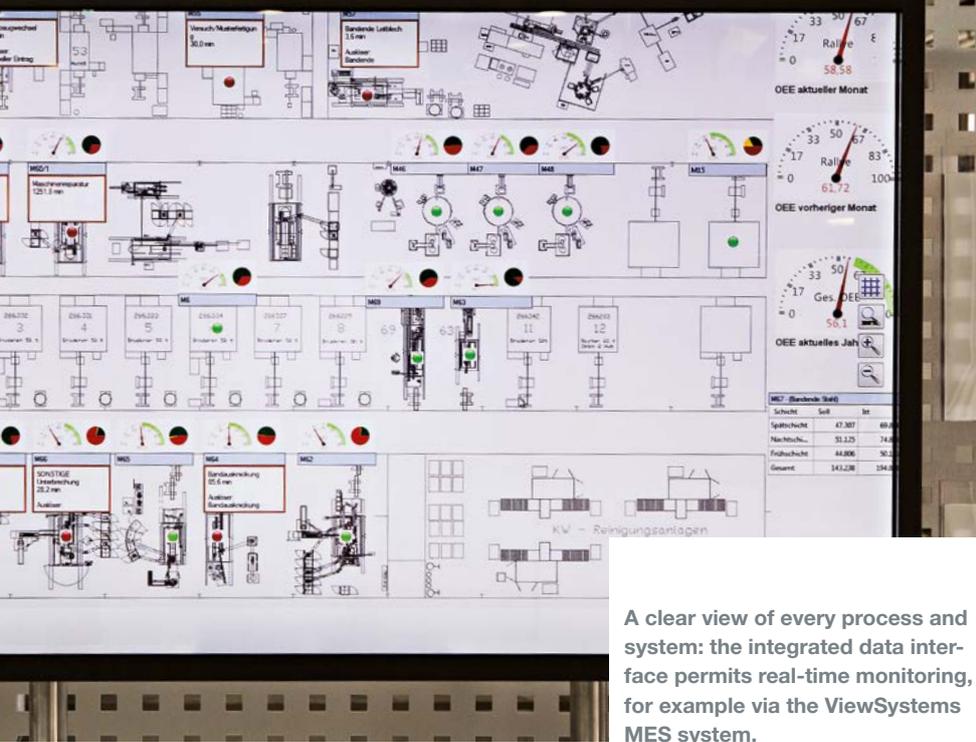
### Smart manufacturing thanks to the MES system

"At the same time, it is important to design processes and workflows to be as efficient as possible," says Mathias Bihler. "Using our solutions, our customers boost their smart production capabilities and make their workflows transparent – thanks to fully networked, individually controlled processes and maximized plant uptime."

One example of this is the VariControl control platform whose intelligent control technology ensures a long-lasting boost in production performance. It makes it easy

**The world's smartest press: The BIMERIC SP excels through its highly efficient continuous-flow manufacturing capabilities. Using this combination system, complete assemblies can be produced directly from the input material.**





**A clear view of every process and system: the integrated data interface permits real-time monitoring, for example via the ViewSystems MES system.**

for users to master even the most complex automation solutions in the field of stamping, forming and assembly technology – uniformly across all Bihler machine types as well as on many third-party systems. The integrated data interface to ViewSystems' MES system provides the functionality of an embedded system. "Thanks to our software, a single Bihler system is transformed into a networked production unit which communicates online with the ERP system, other machines and the warehouse system, optimizes processes automatically and helps human operators optimize their use of machines and systems alike," says Bernhard Rohe of Menden-based ViewSystems GmbH. In practice, this makes it possible to create seamless real-time analyses of all the process information and introduce the corresponding, specifically focused optimization measures. As a result, the VariControl control platform, in combination with the ViewSystems solution, is a perfect example of the fourth industrial revolution in action as well as of CPS-assisted production in a smart factory. That is why this approach has already been successfully adopted by a number of enterprises. These include, for example, Saxonia-Franke GmbH & Co KG in Göppingen or ABB Stotz-Kontakt GmbH in Heidelberg, both of which have improved the performance of

their Bihler systems by an average of eight percent using this solution.

#### **Broadband support via remote maintenance**

"Through the integrated recording of measured values and production data, we guarantee that our customers benefit from in-depth process monitoring and outstanding transparency in all their production activities," explains Mathias Bihler. "However, it is just as important to help improve the availability and productivity of our systems on site. To offer this support, we provide our remote maintenance portal." This is a fully networked remote service solution which analyzes and, if necessary, optimizes all network modules reliably, transparently and flexibly. It uses a wide range of communication technologies operating at maximum bandwidth to permit in-depth remote diagnostics and ensure the rapid, reliable elimination of potential sources of malfunction and error. Its functions include the diagnosis of all control components, access using development tools for diagnostic and maintenance purposes, remote control of the display computer and the import of updates. The remote maintenance solution was created in close collaboration with Innominate GmbH and Lucom GmbH. More than 400 Bihler customers are now successfully using this solution."

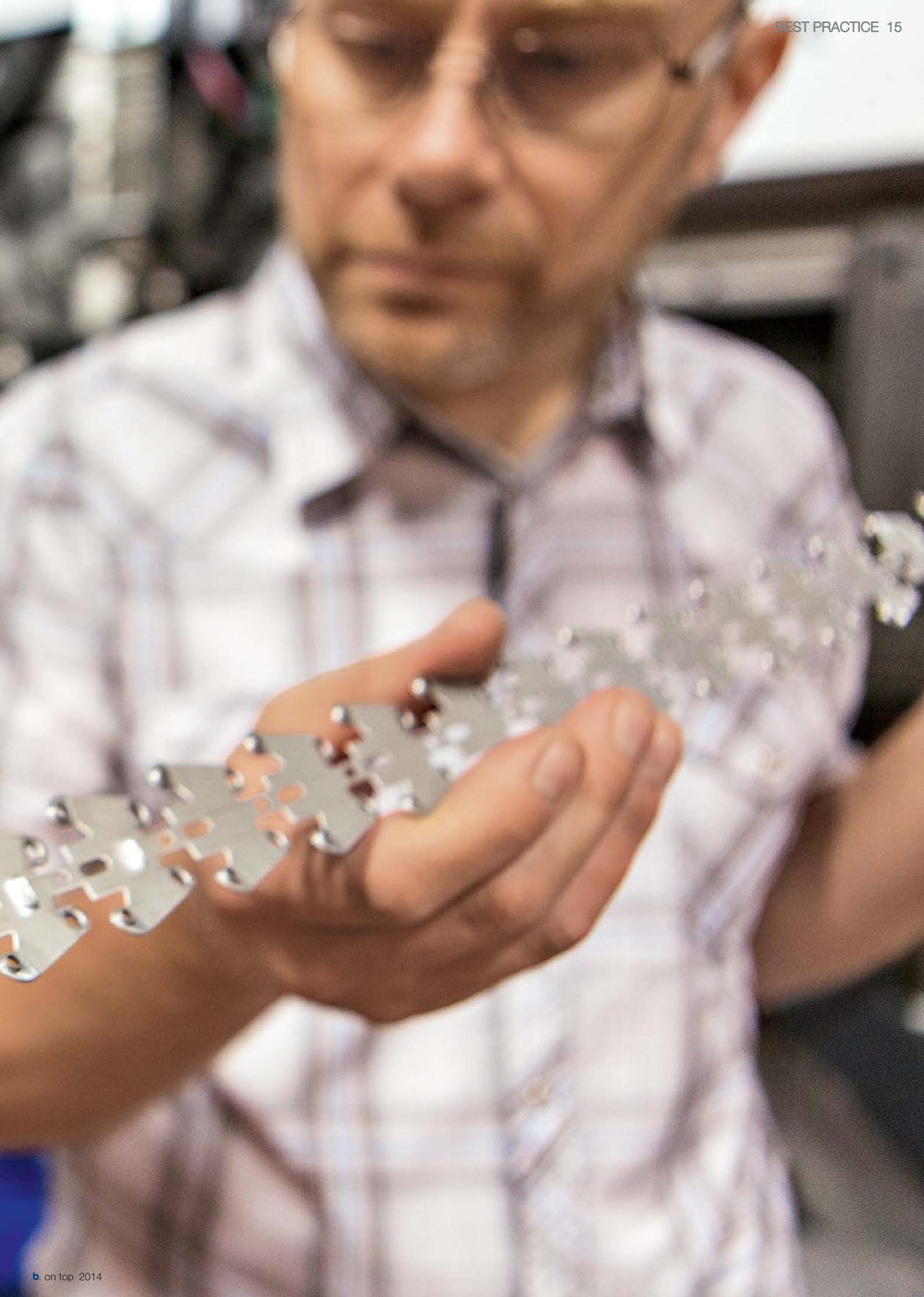
"The customer is always in control and it is they themselves who initiate remote maintenance at the touch of a button," explains Tobias Gschwend from the Bihler Remote Service department. "Almost all our new systems are now equipped with the remote maintenance option."

#### **Intelligent value-added chains**

The VC 1 control platform, the MES system, and the remote maintenance capability are very practical examples of Industry 4.0 at work today within the context of intelligent production in a smart factory. They are representative of the possibilities of cross-enterprise networking and the integrated interconnection of machines, systems and resources within ongoing processes. This type of innovation is leading to dynamic, self-organizing value-added chains that are optimized in real time and can be designed and controlled on the basis of various criteria such as costs, availability and resource consumption. In this way, Industry 4.0 will come to be a natural and logical component of a networked, intelligent world. "In the future, the number and functionality of the features provided by, for example, the VC 1 controller or the MES system will continue to grow. The focus will be placed on economic aspects that will further boost value-added and the economic efficiency of all processes," explains Mathias Bihler. "This will further reduce production outages and eliminate identified sources of error. Our vision is of a production system that possesses the intelligence to control itself and which itself automatically compensates for variations, whether due to differences in materials, wear or other causes." ■

# WANT TO ENHANCE EFFICIENCY?

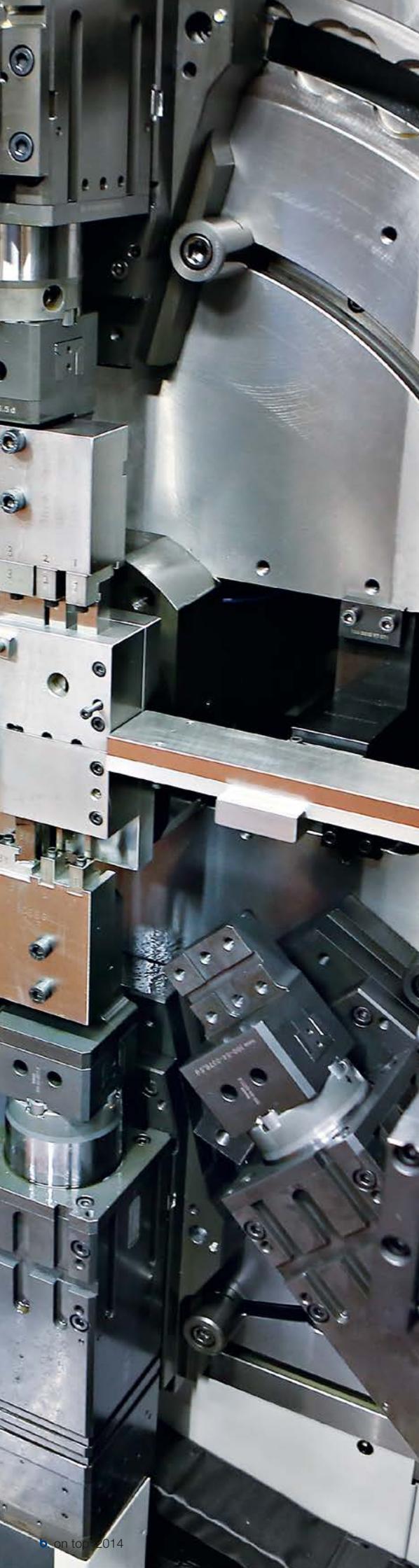




LESJÖFORS BANDDETALJER AB, VÄRNAMO (SE)

# DEPLOY INTELLIGENT TECHNOLOGY!





Lesjöfors Banddetaljer AB in Värnamo, Sweden, was the first company to place an order for a GRM-NC stamping-forming machine. The global player realized from the outset that Bihler's NC technology was the way to enhance efficiency in production – thanks to much shorter setup times, higher cycle rates, optimum reproducibility, maximum flexibility even for small batch sizes and full tool compatibility with its existing Bihler machines. At the same time, the technology offers any amount of scope for new projects. Thus the new GRM-NC is enabling Lesjöfors to boost its competitiveness considerably and further consolidate its position as one of the leading manufacturers of springs and stamped and formed parts.

Sweden's Lesjöfors Group is one of very few businesses to have accumulated centuries of experience in the manufacture of springs and stamped and formed parts. Now owned by the listed company Beijer Alma AB, Lesjöfors was founded way back in 1675 and started its spring manufacturing operations in 1852. Its current product range includes standard springs, customized springs, gas springs, wire parts and stamped and formed parts, as well as shock absorber springs for the automotive sector. Lesjöfors employs around 1,400 staff at 19 production sites in eight countries. The bulk of the company's sales are generated in the German, Swedish, British and Chinese markets. Lesjöfors is known for its unwavering focus on growth by means of ongoing investments in new technologies and regular acquisitions of new companies with a view to strengthening its global market position. "We are also constantly updating the machinery in our business so as to guarantee top quality at competitive conditions. This is a crucial part of Lesjöfors' strategy for success," says Kjell-Arne Lindbäck, CEO of the Lesjöfors Group.

#### Clear decision to opt for NC technology

This is particularly true in the case of Lesjöfors Banddetaljer AB in Värnamo, Sweden. Founded in 1911, the company focuses entirely on manufacturing springs and complex stamped and formed parts from thin, but high-strength materials. It employs 50 staff and boasts extensive machinery including 21 Bihler machines of types GRM 80, GRM 50, MC 82, MC 42 and RM 40. Two RM 40K machines were additionally acquired three years ago. "The time is right for us to invest in new machines and technologies when we can see that they will enhance production efficiency in the long term," says Jakob Lindquist, Managing Director of Lesjöfors Banddetaljer AB. And when Otto Bihler Maschinenfabrik presented its new generation of servo-controlled stamping-forming machines, Lesjöfors Banddetaljer AB was the first of Bihler's customers to opt for the new servo-controlled technology and order a GRM-NC. This was equipped with six NC units, a 40-tonne press, the NC material feed mechanism RZV 2 and the VariControl VC 1 control unit.

**At the controller: Stefan Svensson, toolmaker (front) and Niklas Johansson, machine supervisor.**



► **Shorter setup times, higher cycle rates**

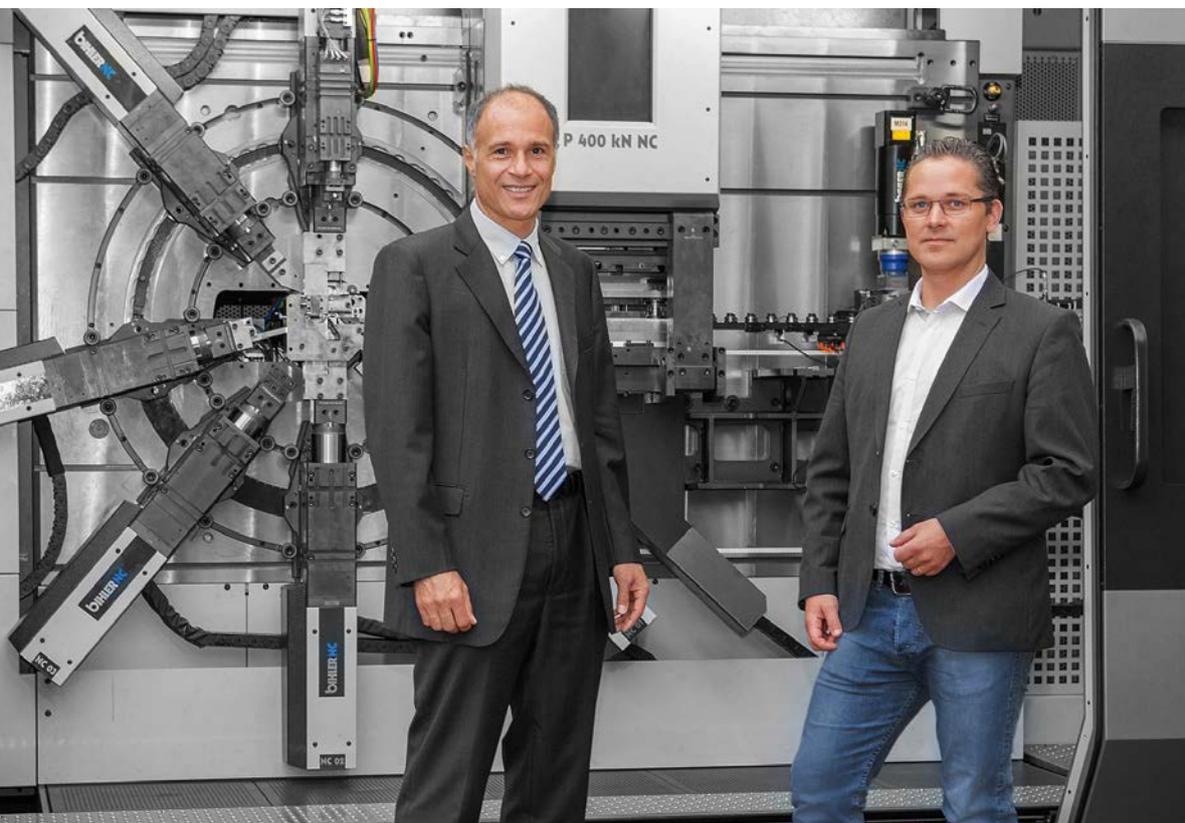
“The new GRM-NC caught our attention from the outset,” says Jakob Lindquist. “For us, the most important advantages are the significantly shorter tooling times and the possibility of optimizing production speeds.” Specifically, this means that it now takes under sixty minutes to complete a tool change, instead of the pre-production setup process lasting between eight and ten hours, as it did before. “Our production operations have consequently become much more flexible, especially in cases where frequent item changes are involved. At the same time, the controller guarantees excellent component reproducibility.” The faster cycle rates of the GRM-NC are another major benefit: “We have managed to increase our production speeds from, say, 140 parts to up to 200 parts per minute.”

**Greater complexity, full tool compatibility**

Moreover, thanks to the GRM-NC, even complex parts can be manufactured much more quickly and simply than before. “We can see the advantages this brings, in particular for our new projects. The GRM-NC allows us to produce higher-quality parts with more functions,” explains Jakob Lindquist. Another plus point was that the existing GRM series tools could be adapted smoothly to the new GRM-NC. “To date we have adapted six tools from our existing GRM machines to the new GRM-NC, and fully redeveloped one tool. This large number of tools, combined with the shorter setup times and simple tool changes, ensures that we can maintain the high level of performance we require for our small runs,” says Lindquist.

**Perfect basis for product optimizations**

“Even if we were the first customer to move over to Bihler’s new NC technology, the advantages were clear to us from the very beginning and we therefore decided to pursue the project,” says Lindquist. “Of course we also did the standard profitability calculations, based mainly on the shorter setup times. They showed that GRM-NC was well worth investing in.” But the investment gives the company more than just the ability to improve existing processes. It also enables Lesjöfors Banddetaljer AB to implement entirely new projects. “The GRM-NC allows us to perform increasingly complex operations in the same process much more efficiently than before. That in turn creates substantial value-added for our customers, thereby enhancing our own competitiveness.” And that’s highly necessary, as custom-



**Jakob Lindquist, Managing Director of Lesjöfors Banddetaljer AB, and Mathias Bihler in front of the new GRM-NC.**

The new GRM-NC stamping-forming machine minimizes tooling times and helps optimize production speeds. It also offers greater versatility for more complex tasks.

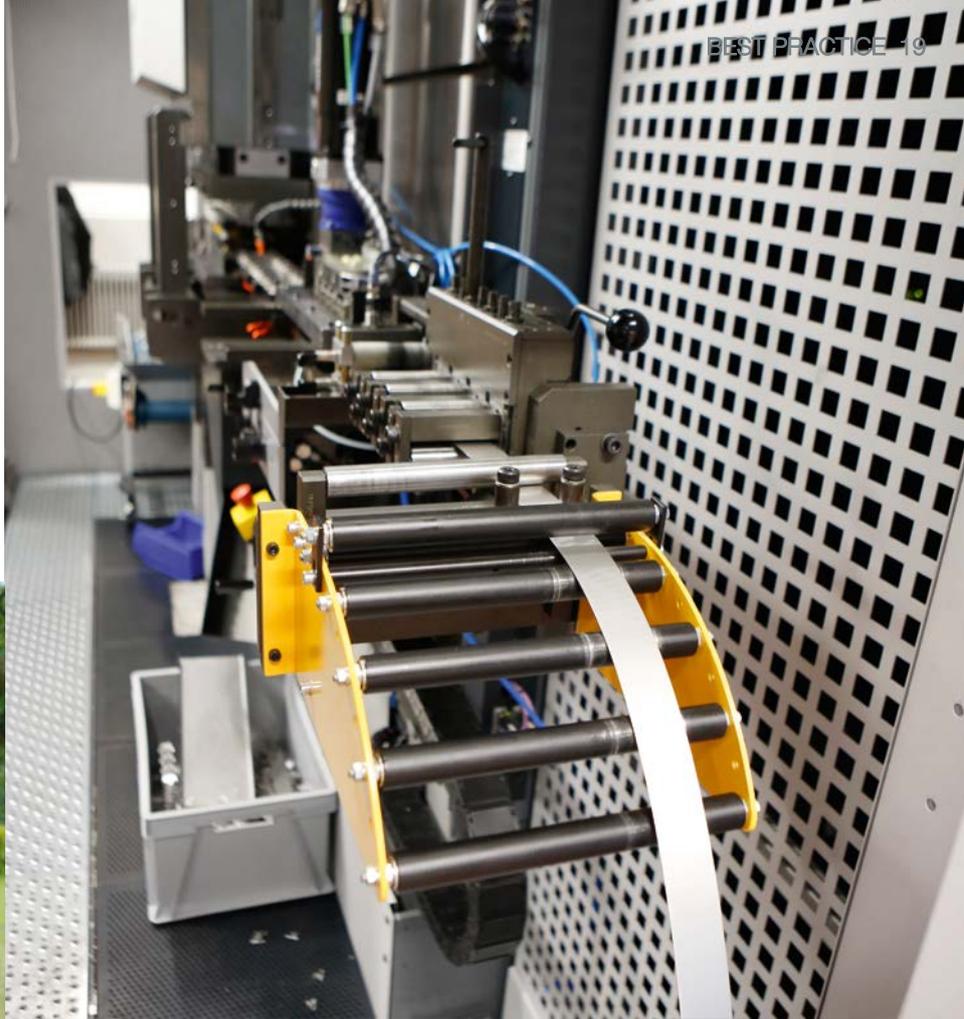


Optimum on-site support Göran Bragd, Bihler's representative in Scandinavia, BEP Teknik AB, Tel. (+46) 702 69 29 80, [www.bep teknik.se](http://www.bep teknik.se), [goran.bragd@telia.com](mailto:goran.bragd@telia.com)

ers are increasingly demanding components of a lower weight as well as lower prices across the board. "We are satisfying these requirements by optimizing our products – for instance by improving component performance, reducing the number of individual operations and substituting materials," explains Jakob Lindquist. "And of course the new GRM-NC provides us with the ideal conditions in which to implement these developments." ■

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**LESJÖFORS**  
SPRINGS & PRESSINGS



## INTELLIGENT PRODUCTION SYSTEMS

# “HIERARCHICAL LEVELS AS WE KNOW THEM WILL NO LONGER EXIST”

Intelligent systems and Industry 4.0 are the answers to the increasing complexity of markets as well as of enterprises themselves. In this interview, Professor Thomas Bauernhansl explains where the current challenges lie and what potentials can be successfully exploited as a result.

**b. on top:** What characterizes intelligent systems?

**Dr. Thomas Bauernhansl:** Machines, tools, workpieces or even tasks are intelligent if they are able to communicate with one another and with humans and are also able to learn. They include, for example, robots, sensors or databases such as apps and clouds. These systems can access physical data worldwide, for example in the form of production, logistical, engineering, coordination and management processes and Internet services, and process these in near real time. The key to success lies in the decentralization and autonomy of the factory systems while keeping the human factor at the heart of it all. All the industrialized economies and multinational corporations have recognized the signs of the times. However, it is first and foremost German companies that have been putting in the research and work needed to make the fourth industrial revolution – Industry 4.0 – a reality.

**b. on top:** What does Industry 4.0 mean?

**Dr. Thomas Bauernhansl:** Industry 4.0 stands for the full digital networking of all the communication levels involved in production technology. From this definition, it is possible to derive the main objectives for the use of Industry 4.0 applications, for example enhanced customer benefits or increased competitiveness through the optimization of quality, delivery service, flexibility or costs. Industry 4.0 is based on a versatile, highly qualified workforce operating intelligent, automated processes. Information and communication technologies, driven by Internet technologies, are changing global production and making sustainability and the efficient use of resources possible.

**b. on top:** What role does the issue of interfaces play?

**Dr. Thomas Bauernhansl:** It would naturally be very useful for enterprises if the three levels of automation – namely, the automation level itself, the MES level for production planning, and the ERP level that supports resource planning – were designed in a consistent, co-

herent way. However, the standard interfaces offered by these systems do not yet meet this requirement.

In the future, all these levels will have a service-oriented dimension: Not only the software but also the infrastructure and platforms will be provided as a service. This will result in a network of services in the cloud which will itself also use service-oriented architectures. All this will represent the elimination of hierarchical software structures. Hierarchical levels as we know them will no longer exist and the notion of interoperability will come to the fore. The software services will be combined to form apps and these apps can then be used as specific function scopes or elements in the service of the value-added processes.

**b. on top:** How can increasing complexity be managed expertly and in way that is particularly efficient?

**Dr. Thomas Bauernhansl:** The complexity of the markets is growing continuously. However, the internal complexity of enterprises is also increasing, for example in

## PROFESSOR THOMAS BAUERN- HANSL

... has been Director of the Fraunhofer Institute for Manufacturing Engineering and Automation (IPA) in Stuttgart since September 2011 and, at the same time, head of Stuttgart University's Institute of Industrial Production and Factory Management (IFF). After graduating in mechanical engineering from RWTH Aachen University, he spent the years 2003 to 2011 with the Freudenberg Group, where he worked in the fields of plant and tool technology, vibration technology and sealing technologies.

terms of organization, processes or IT. Manufacturing companies are socio-technical systems in which the dynamic interaction of human and technical factors is far from transparent and often unpredictable. Here, we need methods and tools that can analyze and influence complexity in all aspects of an enterprise. Many approaches concentrate, for example, on standardization and modularization or try to control the complexity of enterprise processes by means of simulations. Our approach starts from the assumption that it is not possible to fully control enterprise complexity and embraces the complexity footprint as well as new strategies that make it possible to actively influence internal complexity. The correct amount of internal complexity thus becomes an enterprise resource and, if handled correctly, ensures enhanced corporate profitability and growth.

**b. on top:** Where is the greatest potential for cost savings?

**Dr. Thomas Bauernhansl:** Inventory costs, for example, can be re-



duced by 30 to 40 percent because real-time information about actual customer needs and stock levels will allow companies to minimize safety stocks and, most importantly, control order quantities in the supply chain better. Warehousing costs will fall, while productivity will increase at the planning and management levels. Failure rates will also come down thanks to the

availability of real-time data which can be correlated with process data, including at cross-enterprise level. This will make it possible to identify and correct problems more quickly and optimize processes. Many companies are already implementing Industry 4.0 and confirm an increase in productivity of up to 50 percent depending on the production scenario. ■



## THE HUMAN BRAIN IS LIKE AN INSECT COLONY

# “THERE IS NO SUPREME INSTANCE”

In nature, intelligence occurs at different levels from the individual being through to social groupings. In this edition of *b. on top*, Professor Rössler explains what makes a living being intelligent and where intelligence is seated at the neural level.

**b. on top:** As a biologist, when would you say that an animal is intelligent?

**Professor Wolfgang Rössler:** The specialist literature does not provide us with any uniform definition on this point, just a collection of properties. It is, nevertheless, possible to identify three core elements. First of all, intelligence demands the ability to adapt to changing situations; secondly, it requires the capacity to recognize the relations between an incentive and its consequences; and, thirdly, the ability to connect the past with the future. In brief, what this means is the ability to solve problems and recognize interrelations, while not working through problems in a stereotypical way but, instead, by transferring previous experience to a new process. The capacity to learn and memory are therefore absolutely crucial for intelligence. This combination is found even in worms and insect larvae – not to mention the social insects that demonstrate excellent learning and memory capabilities. Higher forms of intelligence require the ability to

play through certain scenarios in the mind and project the results into the future. The crow family of birds is able to do this, for example.

**b. on top:** What prerequisites are necessary at the level of the nerve cells if a living being is to display intelligence?

**Professor Wolfgang Rössler:** This can be illustrated best by means of the example of associative learning in which two stimuli are connected to one another. You can, for example, present a honey bee with a lemon fragrance and then shortly afterwards reward it with sugared water. After being trained twice with this sequence of events, the bee already knows that when it senses the fragrance, it must extend its proboscis – it has learned that the lemon fragrance means food. At neural level, this means that when two stimuli occur quickly after one another, something must change in the wiring of the brain. And it can be proved that following the simultaneous occurrence of the two external stimuli, a synapse, for example, that is to say a

point of contact between two nerve cells changes. This change may only persist for a few seconds or minutes. However, it may also last for weeks or even years. That is why we speak of short-term, medium-term or long-term memory. While short-term memory brings about no real structural changes but just makes a synapse a little more permeable, for example, in the case of long-term memory, synapses are genuinely eliminated or new ones formed.

**b. on top:** Nowadays swarm intelligence is a frequently heard concept. What requirements must the individuals in a swarm fulfill in order to make this more intelligent than each of its members.

**Professor Wolfgang Rössler:** Swarm intelligence is indeed a term we hear a lot. Personally, I prefer the term “collective intelligence” because this higher form of intelligence does not necessarily have to occur as part of a swarm but rather in the context of an interaction. Collective intelligence only occurs if the organisms possess communication

## PROFESSOR RÖSSLER

... holds the chair of Behavioral Physiology and Sociobiology at the University of Würzburg. As a neuroethologist, his research and teaching combines neurobiology, behavioral ecology, sociobiology and evolutionary research. In his research into social insects such as bees and ants, he specifically examines the mechanisms involved in communication, orientation and behavioral plasticity, as well as their consequences for the organization of societies.



mechanisms and if they cooperate. In addition, they must be able to react flexibly, that is to say they must be able to adapt their behavior to certain information flows within their local environment. Only in this way is it possible for something new – an emergent product, so to speak – to be created at group level. A honeycomb, for example, is a masterpiece of building skill that is optimally adapted to do what is required of it. However, each individual bee has no conception of this end product – it is more than the sum of the individual inputs. What we find so fascinating about this is that the entire process that leads to the emergent product is completely self-organizing and is not guided by a central control room or hierarchy.

If we now consider the human brain, we can say – somewhat provocatively – that it is not that different from a beehive or an anthill. This is because each individual nerve cell does something very simple: It reacts relatively stereotypically but is nevertheless able to change flexibly in response to cer-

tain configurations of stimuli. And the sum of all the interactions between the nerve cells in the closely networked human brain in turn results in something new, emergent. And just like the ants in their colonies, the neural systems in our brains also act in a self-organizing way – there is no supreme instance

that commands the various areas of the brain and tells them what to do. Our limited logic finds this type of distributed system difficult to grasp. Instead it always prefers to see everything in terms of hierarchical command structures. However, nervous systems work differently. ■



VARICONTROL VC 1 CONTROL PLATFORM:

# INTELLIGENT CONTROL, EFFICIENT PRODUCTION

With its VariControl VC 1 control platform, Otto Bihler Maschinenfabrik is setting new standards in the field of control technology. With its state-of-the-art software and hardware features, it transforms all machine concepts into an intelligent production solution and offers outstanding flexibility and economic efficiency thanks to its integrated recording of measured values and production data. As a result, the VariControl VC 1 is ideally equipped to meet the future demands of Industry 4.0, as practical examples of its current application already demonstrate.

# VC 1

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2009-07-03 09:33:30

Konfiguration 1

Maschinentaktzähler

5580448

Auslastung Hauptantrieb

0 Nm

Temperatur Getriebe

-0,43 °C

Temperatur Presse links

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Whether in the case of the RM 40P stamping-forming machine, the servo-controlled GRM-NC stamping-forming machine or the BIMERIC production and assembly system: In any system, the controller is the crucial interface between the human and the machine. Which is why the demands made of modern control units are so high. They must be suitable for use with all types of system, should be individually configurable for each individual operator and task and must also be versatile enough to be extended to meet future needs. It is to meet exactly these requirements that Otto Bihler Maschinenfabrik has developed the VariControl VC 1 control platform. This represents a new generation of high-end controller that is setting new standards in the field of control technology thanks to its state-of-the-art software and hardware features. For the machine operator, the VariControl VC 1 is like another pair of eyes and ears and permits optimized man-machine interactions. And it makes its presence felt. Because the VC 1 control platform

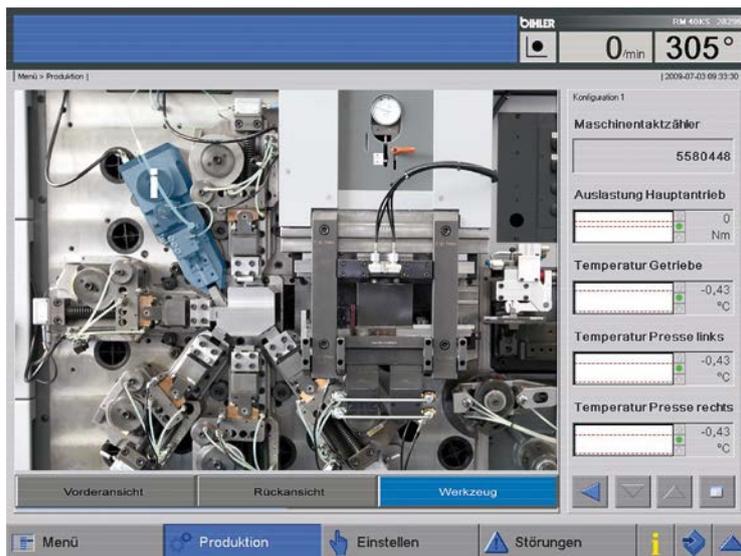
significantly improves the performance of all production plant, while also greatly reducing manufacturing costs. With the VariControl VC 1, it is possible to implement highly complex stamping-forming automation solutions just as easily as it is to perform simpler forming and assembly tasks. And the VC 1 is not just suitable for use at all Bihler systems but can also be deployed in combination with many third-party systems. The entire controller with its power supply unit, electronic control and monitoring system and operating panel is either fully integrated in the machine housing or housed in a free-standing operating cabinet and is connected to the relevant machine by a flexible system of cable ducts.

#### Intuitive, self-explanatory controller

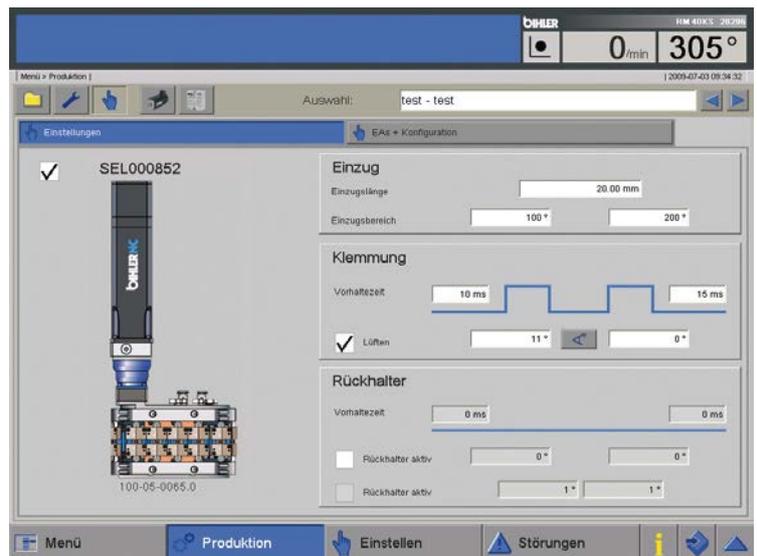
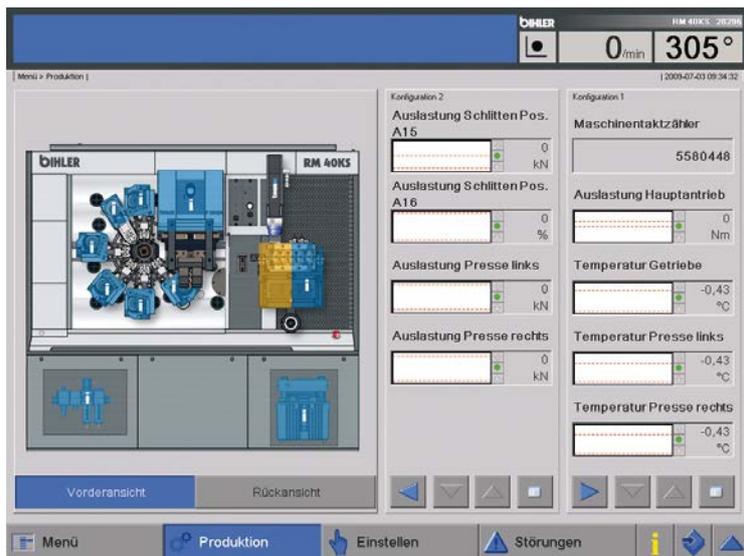
With the VariControl VC 1, Bihler has made the programming, operation and troubleshooting of all systems easier than ever before. This is because the controller has been in-

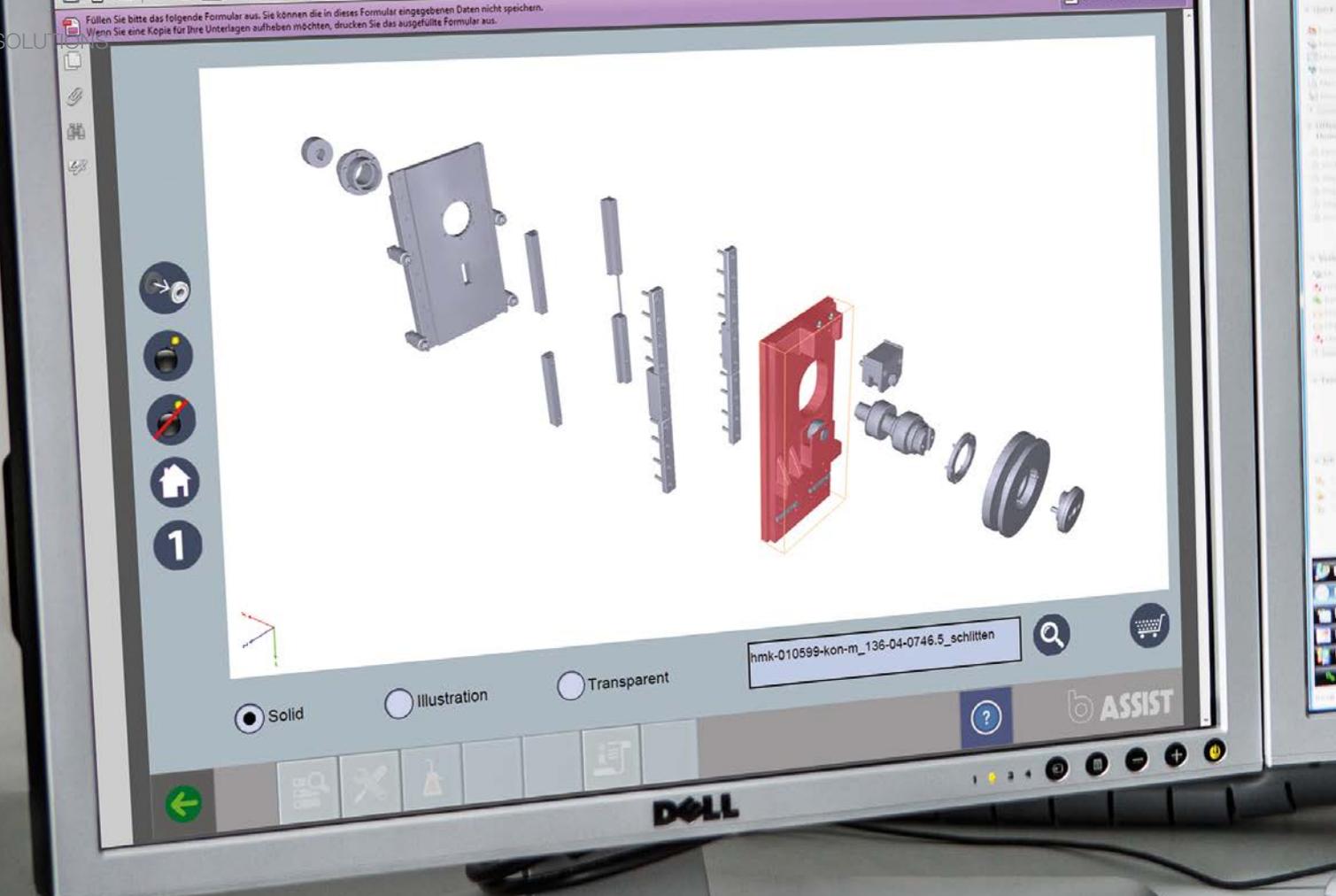
**All at the touch of a button: The VariControl VC 1 control platform can be adapted to meet the needs of any system or task quickly and easily. It can be custom configured and is versatile and reliable enough to cope with any new task that is thrown at it.**

tentionally designed to permit intuitive, self-explanatory operation and does not need any external programming units or any expert knowledge of computing. This ensures exceptionally short setup times, means that the machine is immediately available, and minimizes the danger of operating errors. An industrial PC with the VX-Works operating system and Ethernet-based buses (Powerlink) for connection to the axis control mechanism is used as the control computer. The control-



All the features necessary for programming, operation and troubleshooting can be called up quickly in the VC 1's menu. This provides self-explanatory screens in which users can enter process data for tool settings, valves, safety mechanisms, NC movements or feed movements.





With bASSIST, the VC 1 controller comprises a multimedia diagnostic and online help system. All the necessary help functions, for example in the form of information texts, operating instructions, images, graphics and videos can be called up while the machine is running.

► The controller is programmed and operated using a Microsoft Windows operating system. Setup personnel can adjust all the machine functions as well as the number of axes and their movements via a 15" color TFT touchscreen display and foil console coupled with a multifunction keypad. All axis movements are programmed as cam geometries and can be flexibly associated with different control axes.

#### Flexible and extensible

"By pressing on the so-called hotspots - the areas marked in yellow on the basic machine-specific image, setup engineers can switch straight to programming mode," explains Richard Wagner, Head of E-design and Development at Otto Bihler Maschinenfabrik. He continues, "This provides self-explanatory screens in which they can enter process data for tool settings, valves, safety mechanisms, NC movements or feed movements, etc." With the

VC 1 control platform's easy-to-use data entry screens, it is possible in the basic version to program up to 24 NC axes quickly and easily and integrate these without difficulty. These include slide units, feed units, presses, thread tapping and screw insertion units, as well as other controlled devices. If additional manufacturing steps are needed then the VC 1 can be extended to a maximum of 48 axes.

#### Customized ease of operation

The production images and GUI for real-time data can also be configured as required depending on the user's needs. As a result, shortcuts can be created for rapid function calls, and important product data can be arranged clearly on the start page in the light of current requirements. Malfunction messages can be extended with separate instructions about how to respond, presented in the form of pdf files, jpg images or wmv videos. In addition, it is possible

to modify the display language of the menu and tool texts as desired without having to make any changes in the program. This capability is also available during live production and therefore helps prevent downtimes. The fact that even non-European texts can be integrated means that the VariControl VC 1 is perfect for global use.

#### Perfect support thanks to bASSIST

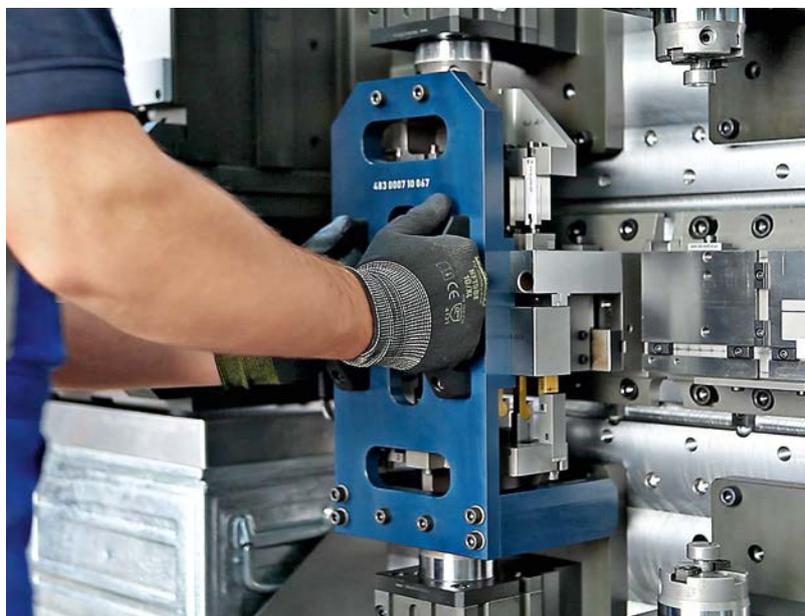
And if assistance should ever be needed: The VC 1 control platform comes with bASSIST, a multimedia diagnostic and online help system that provides clear, easy-to-follow instructions which enable even less highly qualified employees to operate their machines easily and reliably. All the help functions such as information texts, operating instructions, images, graphics and videos can be called up while the machine is running. The blue areas on the basic image allow operators to go direct-

ly to the documentation relating to the various machine elements. Users can also create custom hotspots as shortcuts for function calls, as well as machine and tool-specific help functions. "Thanks to BASSIST, qualified users can manage processes intuitively and optimize them themselves," explains Wagner. "It helps less highly qualified operators to correct malfunctions themselves – for example during the night shift." All the production screens have been designed to enable machine operators to select everything they need during productive operation.

#### Integrated recording of measured values and production data

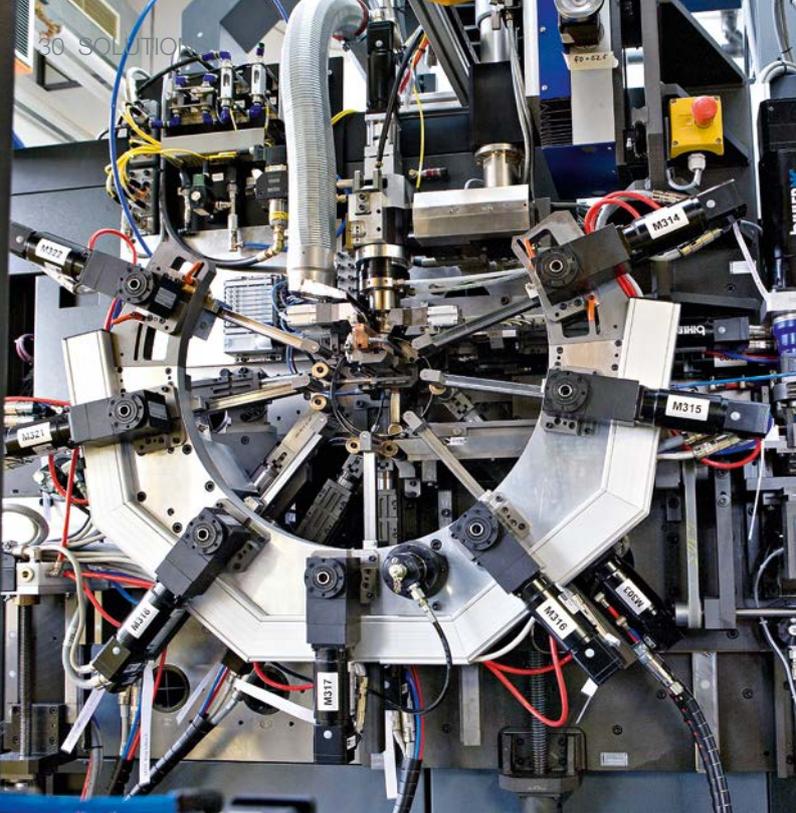
As a sophisticated, state-of-the-art control platform, the VariControl VC 1 automatically records all measured values and production data. This guarantees the efficient monitoring of all processes and a high level of transparency during production. All the processes and all manufactured parts are precisely documented and the data can be called up online in real time thanks to the intensive networking of all machines and production equipment. All of this makes the VariControl VC 1 a genuinely intelligent controller that already meets all the demands involved in manufacturing using the Cyber-Physical Systems (CPS) that will characterize the smart factories of tomorrow. The acquired data can be analyzed anywhere and at any time using the ViewSystems MES system and forms the basis for any subsequent plant optimization measures, for example. During the continuous online diagnosis of the machines and all the associated processes, the emphasis is placed on secure, communications and networking that ensure a high level of access protection. The same also applies to

the Bihler remote maintenance solution which allows customers to connect to Bihler's experts online at the touch of a button in order to cooperate in the correction of errors and the implementation of optimization measures. ■



## IN PRACTICE: SETTING UP A TOOL MODULE

The VC 1 control platform therefore provides a whole range of particularly useful benefits which quickly show their worth in practice. The best example of this is the simple tool changing capability, for example at a GRM-NC stamping-forming machine. First of all, the currently mounted tool is dismounted using a quick-change system. The relevant slides are then adjusted and positioned fully automatically. The new tool is now inserted and the operator calls up the process data stored in the VC 1 controller – and production continues, simply, at the touch of a button, and 100 percent reproducibly. ■



## AWARD-WINNING SOLUTION: VC 1 WITH MORE THAN 76 AXES

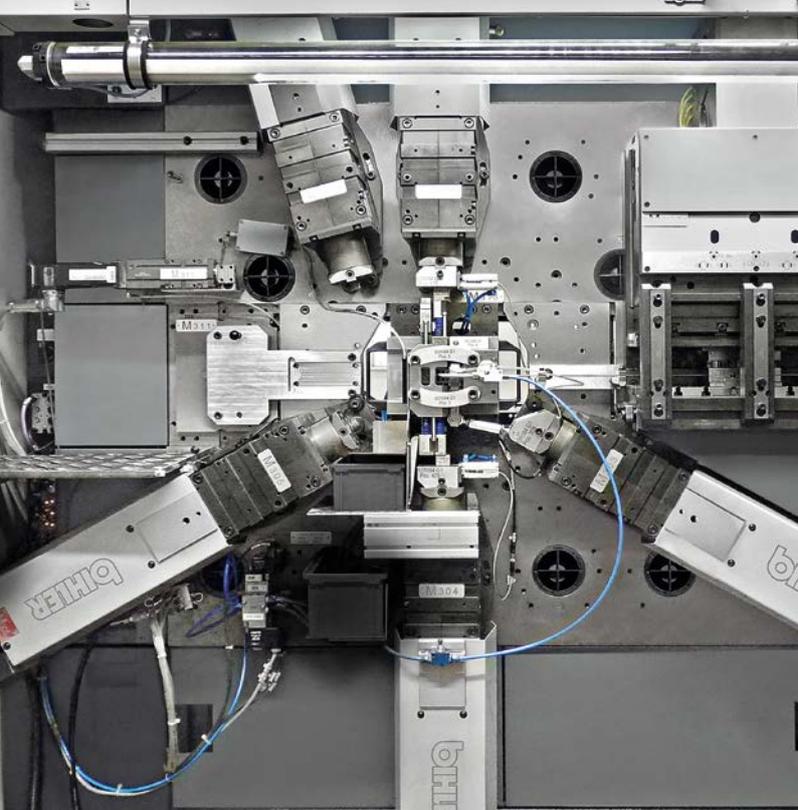
The extendability and power of the VC 1 controller are clearly demonstrated by its use in the narrow strip laser forming operations of the company Freudenberg Stanz- und Umformtechnik in Weinheim. Here, the VC 1, which acts as the central platform, controls not only the 76 NC axes for forming and machining processes but also another 20 adjustment drives for positioning tasks, two industrial robots for parts handling, 970 digital inputs/outputs, 50 analog inputs/outputs, six pressure control circuits with regulator functions and a laser system used for quality supervision. As a result, it is possible to manufacture a wide range of seals directly from the coil right through to the inspected part, while benefiting from maximum process reliability, exceptional production system performance and extremely efficient resource utilization. That is why the solution was chosen to receive the German Innovation Award and Climate and Environment Innovation Award. ■



## PERFECT FOR LARGE SERIES AND ONE-OFFS



The VC 1 controller not only optimizes the production of large series. It is also perfect for customer-specific short runs right down to the manufacture of one-off items. This is demonstrated by the new production line for circuit elements which Belden Electronics GmbH in Neckartenzlingen has constructed in collaboration with Otto Bihler Maschinenfabrik. This permits the production of the new GDM series of circuit elements in either large runs or as single one-off items – with individual designs, colors or special packaging accessories. This is possible thanks to the extremely versatile BIMERIC servo-controlled production system which permits extremely fast tool changes, as well as to the VC 1 controller which acts as the central platform, continuously collecting a vast quantity of measurement and production data, evaluating this and then making improvements to the system by itself. ■



## PILOT PROJECT: SELF- CORRECTING TOOL



The VC 1 control platform is also ready for future applications brought about by the fourth industrial revolution. One current example of this is the development of a self-correcting stamping and forming tool for the manufacture of stamped and formed parts from high-strength materials. The VariControl VC 1 control platform and BIMERIC servo-controlled system are vital components of the innovative solution which Bihler developed in cooperation with Paderborn University's, Faculty of Metal Forming and Casting and Faculty of Control Technology and Mechatronics (RtM) as well as with Weidmüller GmbH & Co. KG. The stated aim of the project was to achieve resource-efficient production through minimized material losses, coupled with quality enhancements through optimized process parameters. Norbert Mueche, who led the project for Bihler, explains: "Using a high-speed camera to measure component geometries, it is now possible to detect geometrical discrepancies as early as the production stage. The measuring system transfers the recorded values to the intelligent VC 1 controller in real time. Here, a special software program ensures that the tool is adjusted automatically before the tolerance limits are exceeded." The result: No more defective parts are produced, the machine does not have to be stopped and production can continue uninterrupted. Downstream quality assurance measures are also unnecessary because these are now integrated in the process itself. It is also no longer necessary to perform adjustment operations when changing coils. ■

## CAN ALSO BE RETROFITTED TO PRE-OWNED MACHINES

In the slimmed-down version VC 1-E, the VariControl machine and process controller even enhances the performance of pre-owned Bihler machines. Such machines are equipped with the new controller as standard during their general overhaul. The VC 1-E makes it possible to equip up to six NC axes for feed functions or positioning tasks. This allows users to benefit from a range of new production capabilities. With integrated analog process monitoring of 16 machine functions and 16 tool functions, as well as a range of other capabilities, the unit guarantees optimum process reliability.

## READY FOR INDUSTRY 4.0

The VariControl VC 1 control platform is an intelligent controller that already meets all the requirements for production in the smart factories of the future. The advantages at a glance:

- Reliable communication and networking with external systems
- Minimized downtimes through continuous online machine diagnostics including all processes
- Optimized production through transparency at all stages (MES)
- "Self-correcting stamping-forming tool" (Bihler – Weidmüller) as an example of successful implementation
- Simple networking of third-party machines and process modules with Bihler systems
- Comprehensive operator support in the form of setup and tool change videos, the bASSIST online help system, and remote maintenance
- Efficient spare parts management with networked procurement system
- Intelligent solution that can be retrofitted to older Bihler machines

# BIHLER INSIDE

With its systems and technologies, Otto Bihler Maschinenfabrik is synonymous with quality, security and reliability. These attributes also apply to all the parts and product families manufactured on Bihler machines. And these can be found in practically every area of day-to-day life – from razor blades to Allen wrenches, in vehicle passenger compartments or in medical engineering.



## A SAFE SUPPLY

The safety clip for hypodermic needles minimizes the risk of infection due to accidental puncturing of the skin when handling hollow needles. Once the clip has been activated, the metal part encloses the needle tip and protects the medical staff during both utilization and disposal. It also makes sure that a needle that has been used once cannot be used again. The metal clip is manufactured on a Bihler RM 40K stamping-forming machine which produces at a speed of 300 parts per minute. Seven clip sizes are available for different needle diameters. During the production process, the material is first fed in and then each safety clip is stamped, coined, formed and finally separated. Bihler's innovative technology guarantees outstanding precision during the entire manufacturing operation. At the same time, it is possible to adjust each forming movement in the forming tool separately, while the linear arrangement of the components means that the forming tool itself is very clearly structured. A further advantage lies in the long service life of the system which, in this case, is used to manufacture runs of up to six million safety clips. And if it is then necessary to change the tool, this can be done quickly and easily in under 15 minutes thanks to the innovative fast tool changing system. ■

## ON THE BALL

Allen wrenches with a ball-shaped tip are particularly practical when it comes to undoing and tightening hex socket screw connections. They make it possible to tighten or loosen the screws even if the wrench and the screw are not in a straight line. The BIMERIC servo-controlled production system is used to manufacture this type of Allen wrench at speeds of up to 100 parts per minute. The secret lies in the fact that the ball head is produced without cutting. This is because – unlike machining techniques that involve the removal of material using milling cutters – the grain of the material is not interrupted and the ball neck is therefore particularly strong. During the manufacturing process, the gripper feed feeds the hexagonal wire to the ring tool which forms a chamfer in the material. The wire is twisted off here, passed on to the hinged multipurpose transfer device and is deburred and smoothed. After the part leaves the turning station, the ball shape is formed in two ring tools before the wrench is then formed and coined with the appropriate markings. Numerous variants and intermediate lengths can be produced depending on the customer's requirements, while maintaining a constant, high level of machine availability. The service life of the forming punch is considerably longer than that of the tools used in profile milling, thus resulting in considerably reduced tool costs. Further advantages include optimized accessibility during tool changes as well as very short setup and retooling times. ■



## COMFORT AT THE TOUCH OF A BUTTON

Whether for window cranks, windshield wipers or seat adjusters: Electric motors are an integral part of any modern vehicle. And the external housings of these motors are one of the most important components. They must be manufactured with outstanding precision, in particular when it comes to the diameter of these housings. How this can be achieved while simultaneously ensuring high throughput is illustrated by the example of housing production on a Bihler COMBITEC CC 1 Forming Center associated with a BM 1500 servo-controlled production and assembly system for cover assembly. At speeds of up to 70 parts per minute, this system is particularly powerful and thus represents an innovative alternative to the deep drawing of the housings – while simultaneously cutting material consumption, reducing tool costs and simplifying process control. The compact production system offers optimized accessibility and is also impressive thanks to the ability to change rapidly between variants in under 30 minutes, as well as to the simple, fast adjustment capabilities made possible by its NC technology. The housings are fed in, formed and stamped by the CC 1. The cover is then fed in, mounted and caulked. The finished component is then passed to the linear conveyor. The interface with the industrial robots which subsequently package the components rounds off the production system. ■



## GENTLE & THOROUGH

Wet razors with up to five blades ensure an outstandingly thorough shave and help protect the skin against irritation. Thanks to the movable tilting head, these razors optimally adapt to all body contours. The blades themselves are also usually equipped with glide strips or lotions to ensure a perfect result even with sensitive skin types. Modern wet razors are manufactured on Bihler RM 40K stamping-forming machines, for example. During this process, individual magazines with up to 4,000 pre-ground, flat blades are fed into the machine. In the RM 40K, the blades are separated before the side contours are cut. The blades are then formed and cut to the required width. An integrated measurement system checks the geometry of the blades and also ensures that any nonconforming parts are rejected. The blades are then filled into magazines and the finished product is removed from the production area. The particular advantages of the RM 40K stamping-forming machines lie in their very high throughput of 250 parts per minute, their integrated quality control mechanism and their high-precision manufacturing quality. The highly efficient machine and tool concept guarantees the optimum handling of individual sheets. At the same time, even tiny forming angles can be achieved without difficulty even when using hard materials. ■



SCHÜRHOLZ STANZTECHNIK GMBH &amp; CO. KG

# SUCCESSFULLY EXPLOITING MANUFACTURING POTENTIALS

With two new CC 1 systems, including a BM 1500 assembly system and a B 5000 welding unit, Schürholz GmbH & Co. KG, a company based in Plettenberg, Germany, is trading new paths in the manufacture of rolled round components for the automotive industry. With these innovative systems, increasingly complex components can be manufactured ready-for-use in a single operation, not just with outstanding precision but also extremely quickly and in a way that makes efficient use of materials.

Angelo Castrignano, Managing Director (left) and Stefan Wortmann, Divisional Manager for Production and Technology. Photo on the right: Machine supervisor Patrick Hirsch.



In 1918 in Plettenberg, Johann Schürholz laid the foundations for the company, which now has further sites in Poland and China and successfully specializes in the manufacture of embossed, stamped, stamped-formed, and drawn parts. “The aim of continuously improving all our processes and focusing them on meeting our customers’ needs is central to our corporate philosophy,” explains Managing Director Angelo Castrignano. “At the same time, we are constantly exploring new lines of business.”

## High-precision, large-scale production

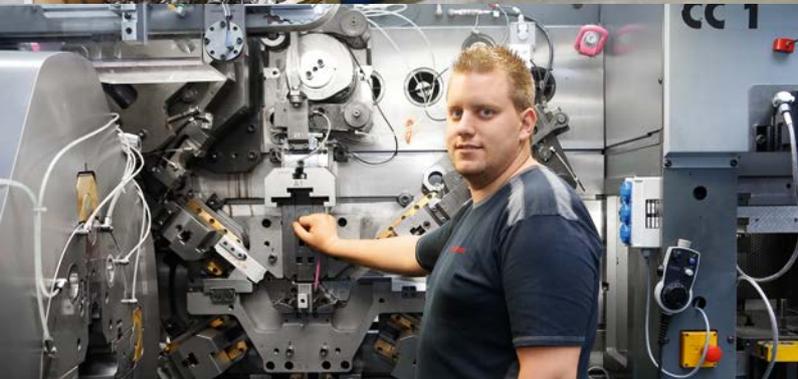
The best example of this is the ultra-modern stamping/forming-

department which Schürholz developed in Plettenberg from 2008 onwards. This started out with a COMBITEC CC 1 Forming Center and a GRM 80P. “In particular in the manufacture of rolled round components for use as housings for electric motors, we identified considerable potential for achieving higher production speeds and precision which we were not able to take advantage of using our existing systems”. In the case of such components, it is crucial to achieve the precise body diameters which permit only very low tolerances. “Thanks to the CC 1, we were able to reduce the tolerances for components with diameters up to 70 millimeters to a tenth of their previous value – while still regularly producing twelve million parts per

year.” By contrast, Schürholz used the GRM 80P to launch the production of headrest tubes which serve as guides for the headrest pins.

## An alternative to deep drawing

In early 2012, Schürholz and Bihler worked together to develop a production solution for ready-to-use electric motor housings with caulked bearing covers. This solution made use of a further CC 1 operating in combination with a BM 1500 production system. “The precision of the components was the crucial factor here because the new solution put us in direct competition with the extremely accurate deep-drawing process,” explains Stefan Wortmann, Divisional Man-



ager for Production and Technology. "However, the combination of CC 1 and BM 1500 allows us to achieve the required precision while manufacturing 15 million parts per year. At the same time, we make huge savings in materials compared to deep drawing, which we estimate at between 20 and 30 percent per year." What is more, the new production method is also considerably faster. Further advantages include reduced tool costs and minimized wear.

Schürholz's stamping/forming department. This is used to manufacture approximately 2.2 million hydraulic engine mounts per year. Here again, Schürholz replaced the conventional manufacturing method based on deep-drawing with stamping/forming technology including an integrated welding process. "The greatest advantage of our method lies in the fact that the welding operation is integrated in the ongoing process," explains Wortmann.

#### Fully automatic, integrated manufacture

As of the end of last year, a third CC 1 machining center with a B 5000 welding system has strengthened the resources of

"The result is fully automated, integrated manufacture which produces ready-to-use components and, what is more, achieves considerable materials savings compared to conventional methods."

#### Friendly, trusting business relations

"Without our investments in the CC 1 systems, we would not have achieved the success that we are enjoying now," summarizes Castri gnano. And new projects, such as the production of motor housings for vehicle areas exposed to the damp are already being planned. As in all the other projects, the company's longstanding partnership with Otto Bihler Maschinenfabrik, which dates back over 30 years, plays a crucial role. "Over the years, a partnership-based, friendly business relationship has emerged," says Castri gnano. "In particular when we receive requests for new components, for example, we can discuss things openly and in confidence and quickly develop the right solution." ■



[www.schuerholz-stanzen.de](http://www.schuerholz-stanzen.de)

**SCHÜRHOLZ**

BEUTLHAUSER STANZTEC GMBH & CO. KG, FREYUNG

# FROM CONTRACT STAMPER TO INNOVATIVE SYSTEM SUPPLIER

Michael Beutlhauser, Technical Director, Christoph Beutlhauser, Commercial Director and Robert Wernsdorfer, Partner and Managing Director (from left to right).

With its new BIMERIC BM 3000, Beutlhauser Stanztec GmbH & Co. KG in Freyung has developed from being a pure contract stamping company to act as a system supplier of complex assemblies. Partnership with Bihler, which delivers the necessary expertise, plays a vital role in this realignment. It has allowed the company to venture into lucrative new lines of business – a trend that will be followed with the introduction of a GRM-NC at the end of 2014. This will allow Beutlhauser to exploit new possibilities in the stamping and forming field.



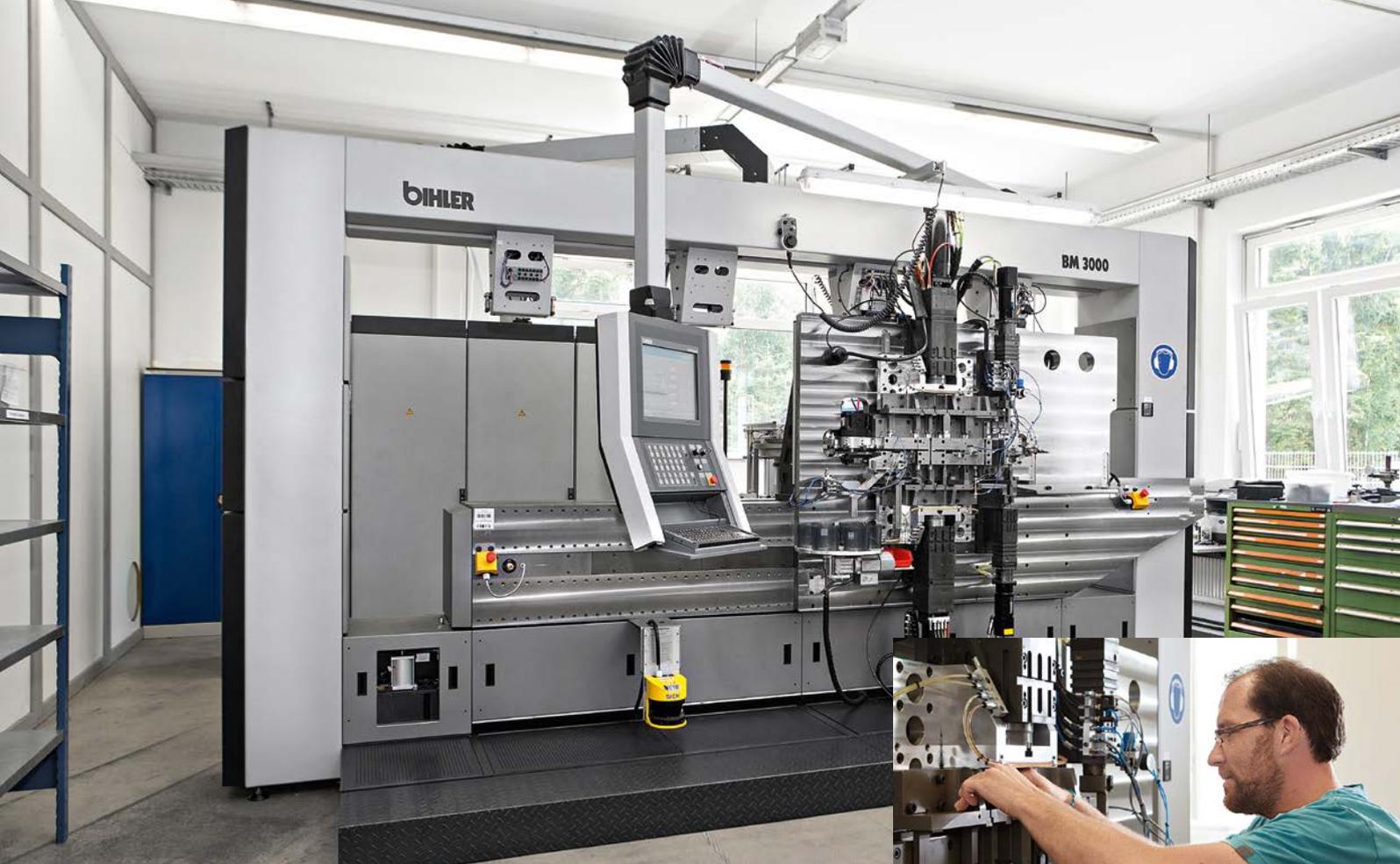
The readiness to take on new challenges and to specialize in innovative business fields has always been central to the corporate philosophy of the Beutlhauser Group which is headquartered in Germany's Bavarian forest. Founded in 1993 by Georg Beutlhauser, the company has grown from the initial team of four staff and now employs some 200 people located at four different sites. Its sectors of activity include the cutting and machining of special alloys, shaping work right down to the tiniest dimensions, as well as the manufacture of punching dies. According to Christoph Beutlhauser, "only companies that continuously extend their own portfolio of products will remain relevant for new and existing customers. That is why

we constantly engage with new, demanding market segments and really get going when others are starting to lose momentum." One key driver behind this high level of specialization is the in-house tooling and mechanical engineering department which was set up in 2005. This also enhanced the level of vertical integration, for example through the internal production of the high-precision assembly machines the company uses for its shaping activities.

#### A BIMERIC machine for the manufacture of complex assemblies.

"Despite this, we were not able to undertake more complex applications that went beyond the use of stamp-

ing technology," explains Michael Beutlhauser. However, the market is increasingly demanding complete assemblies manufactured by reliable, expert system suppliers – in particular given the fact that international competition is making sequential production technologies and simple contract stamping work ever less attractive. It therefore comes as no surprise that Beutlhauser GmbH once again made a clear-sighted decision about its future by choosing to rely on Bihler technology and develop into a system supplier through the purchase of a BIMERIC BM 3000. "Bihler's NC technology offers unlimited possibilities for the manufacture of complex assemblies," explains Michael Beutlhauser. "It allows us to produce complex



stamped and formed parts as well as complete assemblies efficiently and economically – with very short tooling times, outstanding flexibility and optimized product quality.”

**The perfect start with Bihler as partner**

Since the middle of 2013, the company has been producing complex formed wire parts for the automotive industry on its new BIMERIC BM 3000. “Even though at the start, we had no expertise in using the machine and the processes and no trained personnel, production ran perfectly right from the outset,” summarizes Christoph Beuthauser. “This is because Bihler simply offers more: In the form of a trusting, con-

fidence-based partnership backed up by its decades of accumulated knowledge and expertise. That’s worth a fortune to us.” Another plus lies in Bihler’s outstandingly comprehensive portfolio. “Whether our need is for stamping, forming, welding or assembly technology, Bihler can cover all our applications like no other supplier and provide exceptionally efficient, single-source production solutions.”

**A new GRM-NC for the stamping department**

And the new BIMERIC BM 3000 just represents the first step. “As of the end of 2014, a new GRM-NC will create additional stamping capacity at our Freyung

site. We can adapt tools from our cam-controlled machines for use with this new plant and manufacture more complex components at a lower cost,” explains Robert Wernsdorfer, Managing Partner at Beuthauser Stanztec GmbH & Co. KG. “With the BIMERIC BM 3000 and GRM-NC we are optimally placed to cover the entire stamping and forming sector. And the number of Bihler machines installed here is set to grow in the near future.” ■

[www.beuthauser.com](http://www.beuthauser.com)



SCHELL-CONNECT GMBH, SCHONGAU

# WITH BIHLER ON THE PATH TO SUCCESS

Daniel Schell, Managing Partner (left) and Project Manager Thomas Barnsteiner. In photo on right: Victor Kiebke, toolmaker.

With two new hybrid Bihler RM 40P machines for the production of automotive plug-in connectors, schell-connect GmbH in Schongau, Germany, has made a clear-sighted decision in favor of NC technology. At the same time, the company, with its longstanding expertise in the toolmaking field, is a strategic partner of Otto Bihler Maschinenfabrik. The two companies work together to realize customer projects such as the modernization of existing plant and equipment.



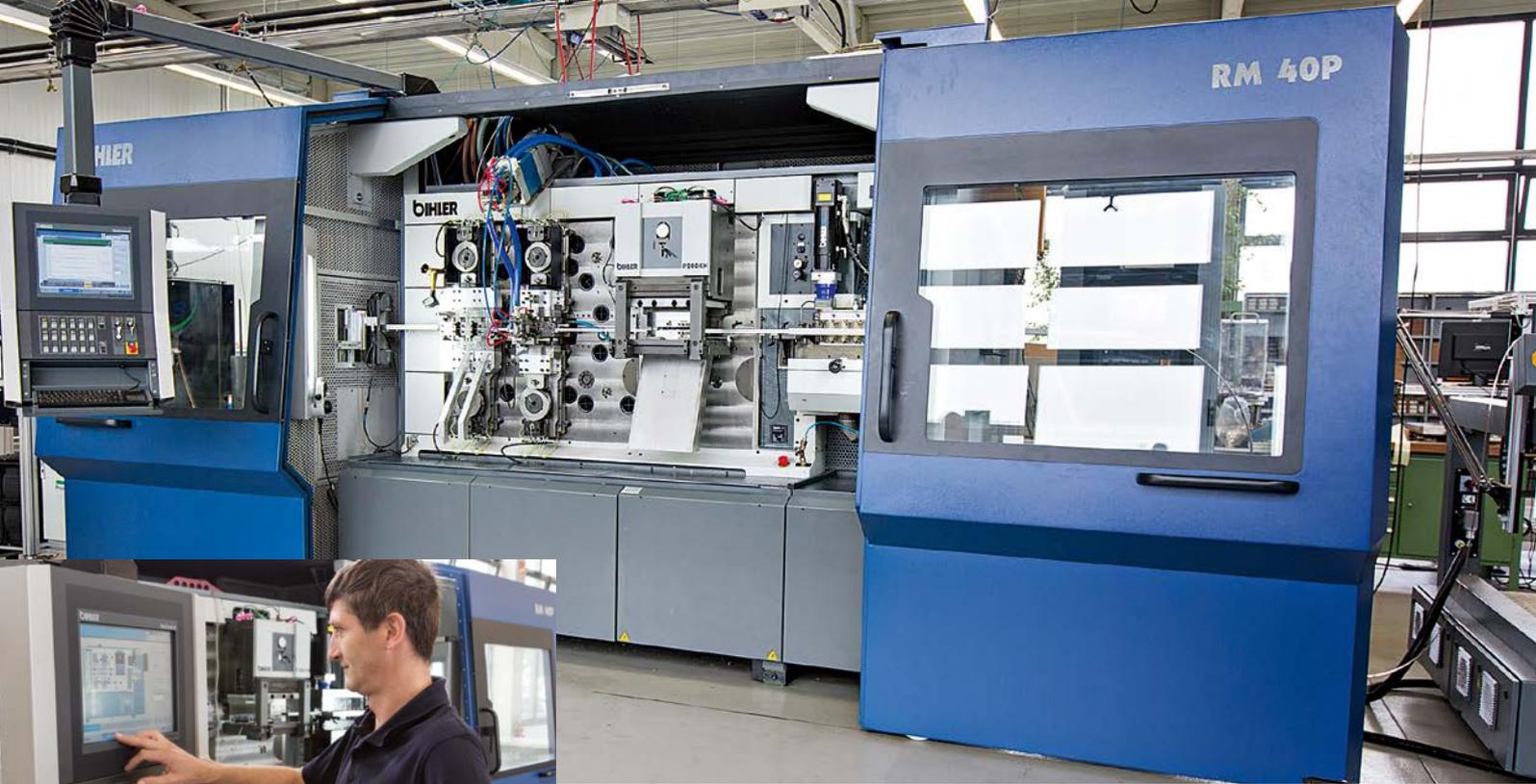
schell-connect GmbH in Schongau makes a lot of connections – on the one hand, together with its customers from the automotive, telecommunications and electronic engineering industries for which it manufactures and markets plug-in connectors, contact elements, stamped and formed parts as well as composite and assembled components. However, as of 1996, it has also had a very special connection with Otto Bihler Maschinenfabrik. One of the reasons for this is that Managing Partner Daniel Schell and Project Manager Thomas Barnsteiner successfully trained at Bihler as toolmaker and power engineer, respectively, before embarking on their studies. Another connection takes the form of the Bihler machines installed at

schell-connect GmbH where two RM 40P stamping-forming units purchased in 2011 and 2013 are some of the company's most recent acquisitions. And last but not least, the family business, which was founded in Schongau in 1986, is one of Bihler's strategic Partners. Together, the two companies work on the successful completion of a wide range of customer projects and are currently cooperating on the modernization of an existing GRM 80, for example. The system was completely reconditioned at Bihler and converted for operation with the new VC 1 controller, while schell-connect GmbH – using Bihler's bNX design software – designed and built a range of new tools for the machine. In such projects, both companies benefit from

the enormous mutual trust and confidence that has developed over the years as well as from the outstanding specialist expertise of their partner.

## Retooling at the touch of a button

And with its extensive experience of stamping and forming technology, injection molding and toolmaking, schell GmbH has a history of wide-ranging expertise. At the same time, the company is continuing to develop and has invested in state-of-the-art technology. An outstanding example of this is the two new RM 40P stamping-forming machines. These are hybrid systems equipped with a B 5000 welding unit and two RZV 2 feed units which also feature integrated NC technology.



“The servo-control technology represents a milestone in the stamping and forming sector and is where the future lies,” says Daniel Schell with confidence. “For us, the greatest benefit lies in the new, dynamic RZV feed unit. This makes it possible to modify the control times in a matter of seconds, and this represents a huge advantage, for example when prototyping a product,” explains Project Manager Thomas Barnsteiner.

#### Dual feed

On the first RM 40P, which operates at 350 strokes per minute, some 30

million plug-in connectors for the automotive industry leave the conveyor belt every year. To achieve this, the strip material is fed in at the same time as the wire, which is cut to length and stamped before being welded to the formed, prestamped strip. The second machine acts as a backup system in the event of an emergency and is also used to produce samples for new projects.

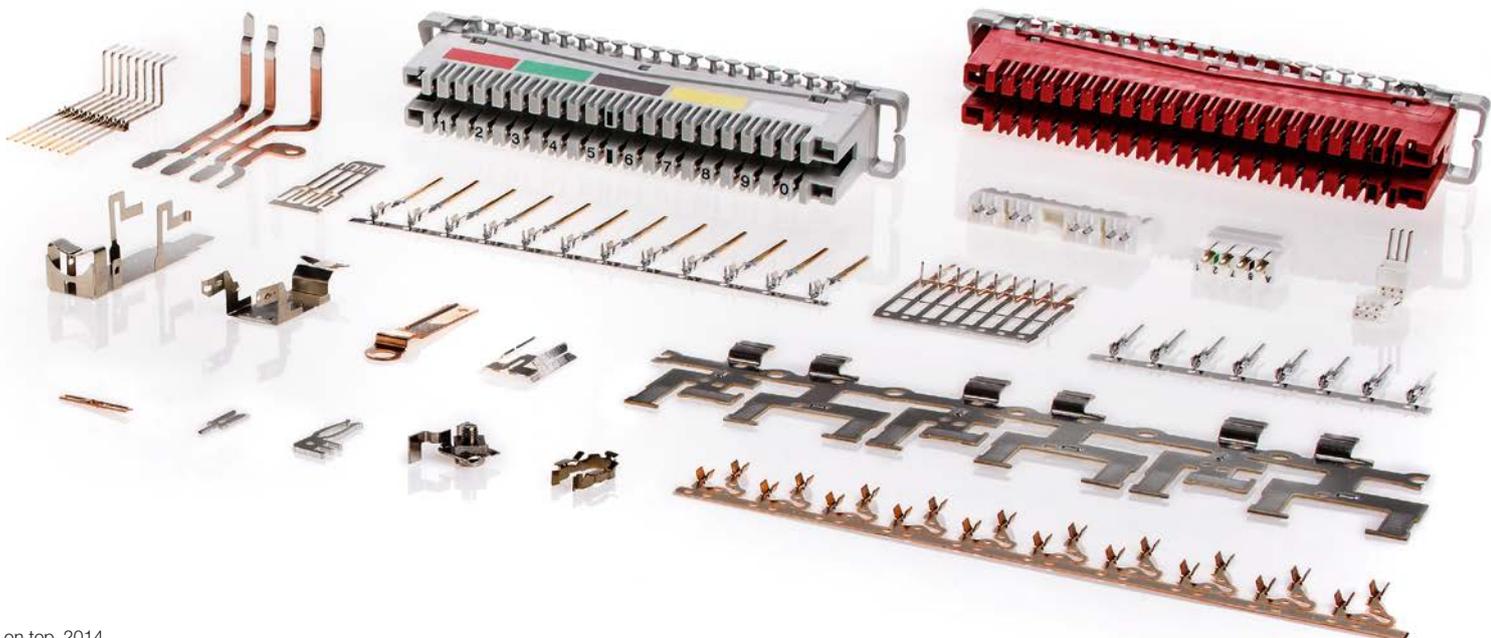
#### BIMERIC extension planned

“And we are planning to introduce a BIMERIC assembly system in the near future. This will make us even more flexible and economical,” says Schell. The solution also makes it possible to optimize production of fully featured solutions consisting of highly complex assemblies – a fac-

tor that will only become more important in the future in view of the requirements which, in the automotive sector in particular, are growing ever more demanding.

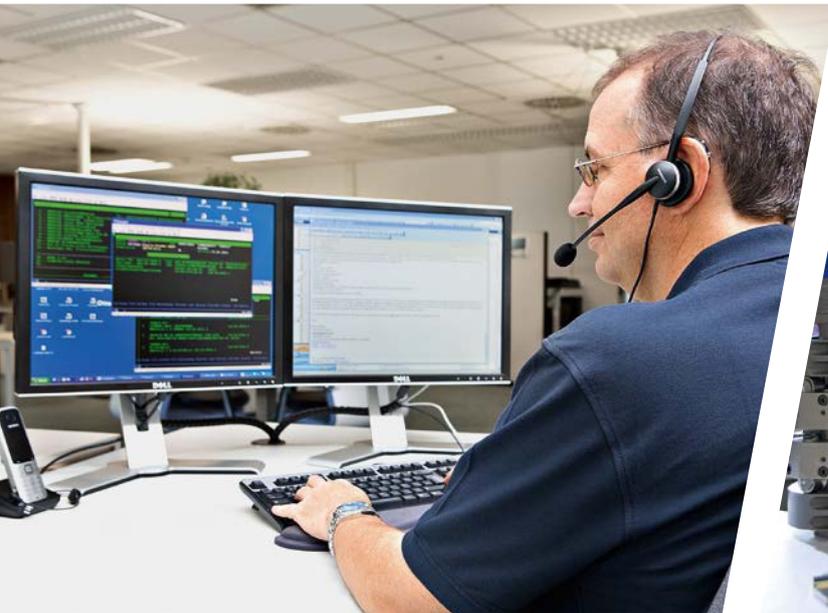
Despite this, schell-connect GmbH’s mechanical and hybrid machines will continue to have a role to play in the future. Schell: “Modern production solutions in the stamping and forming sector should include both types of machine. “NC technology is perfect for items that have to be set up quickly, while the mechanical variant is ideal for fast-moving items.” ■

[www.schell-connect.com](http://www.schell-connect.com)



BIHLER SERVICE &amp; SUPPORT

# NETWORKED SUPPORT



The service life and durability of all plant and equipment supplied by Otto Bihler Maschinenfabrik are legendary. It is not uncommon for machines to continue to run practically fault-free for years or decades. And if, occasionally, a defect does occur then this must be eliminated as quickly as possible in order to ensure the machine's availability and avoid downtimes. In such cases, the central Bihler Hotline is the central point of contact for fast, expert assistance. Under the number +49 (0)8368 18-200, the Bihler team offers a comprehensive service covering all machines on workdays from 7 am to 7 pm.

## Central support ticket software

For some time, support has been provided using a ticket software system. This stores all the activities relating to the case in hand centrally and links them together. The corresponding ticket number then gives customers access to the most recent project status throughout the entire issue processing period. The ticket software is now well-established and is also being increasingly used by the other departments in their day-to-day activities. Because one thing is clear: the collation and documentation of all activities offers considerable benefits in practice.

## End-to-end workflow

That is why, as of fall 2014, the Hotline for the CAx field will also use the ticket software to record issues. It can be reached via the central Hotline number +49 (0)8368 18-200.

Otto Bihler Maschinenfabrik also intends to introduce its digital assembly report in fall 2014. After signing this on-site by means of a signature pad, the customer is sent the assembly report via e-mail in the form a PDF file. Digitization allows Bihler to implement an end-to-end workflow from the digitally recorded on-site assembly report through to automated billing and the assignment of working hours to the relevant accounts.

Fast, uncomplicated support is of vital importance when problems occur or a system malfunctions in order to guarantee maximum machine uptime. To ensure this support, Bihler provides its central Service Hotline whose support ticket software stores all project activities centrally and makes these available as required. As of fall 2014, the Hotline will also introduce the software for use in the CAx field. Other new features include the digital assembly report as well as extended capabilities for the conduct of regular security backups of customer data.



#### Security backups of customer data

At a later stage in the project, other forms, such as maintenance plans, will also be digitized and made available to customers in a clearly legible format. As a service offered via the remote maintenance function, Bihler can regularly back up each customer's digital data, for example their tool programs. Consequently, the customer's data is always protected in the event of any hardware errors or hard disk failures and can be re-imported without difficulty. This service therefore ensures that all customers can resume production without delay if one of their in-house systems fails.

#### Customer input shapes support

With its new digital support features, Otto Bihler Maschinenfabrik is further extending the comprehensive assistance it offers its customers. The aim is to constantly simplify support provision and make it easier for customers to access the help they need. And the ideas behind it often come from you, our customers. Please carry on telling us your ideas and wishes so that we can continue to develop and optimize our services in the way that suits you best. ■

**Otto Bihler Maschinenfabrik provides its customers with fast, uncomplicated help and support – whenever there is a malfunction as well as for any other problems. Alongside the Bihler Hotline, the company also offers many other support services.**

DR. JOCHEN STOLLENWERK AND  
PROFESSOR PETER LOOSEN,  
FRAUNHOFER ILT AACHEN

# FORWARD- LOOKING RESEARCH PROJECT

The aim of the new research project “Laser-based inline procedure for resource and energy-efficient electrical contacting in mass production (InKonMass)” is to develop and test an integrated laser manufacturing procedure for the selective, localized production of gold electronic functional layers on metallic components. The project, which is sponsored by the German Federal Ministry for Education and Research (BMBF) is being conducted by the Aachen Fraunhofer Institute for Laser Technology (ILT) in collaboration with Otto Bihler Maschinenfabrik and other partners. In this edition of *b. on top*, Professor Peter Loosen and Dr. Jochen Stollenwerk from the ILT talk with Mathias Bihler and explain the objective, conduct and benefits of the innovative research project.

**b. on top:** What is the “InKonMass” project about, what is the background to it?

**Professor Loosen:** The functionalization of surfaces and layers is one of the most important key technologies of the 21st century. It helps give traditional materials new or improved properties and can greatly increase the efficiency and durability of existing processes. At the same time, it permits the development of new materials for resource-efficient industrial use. The “InKonMass” project focuses on production in the electronics industry. This is characterized by increasing levels of functional integration coupled with very high throughput volumes. The aim of the research project is to develop and test an inline, additive laser manufacturing procedure for the selective localized production of electronic function layers. The procedure is intended to be developed, for example, for

the manufacture of ready-to-use contact components from metal grids. In concrete terms, the aim is to apply conductive gold functional layers at targeted locations on stamped parts at speeds of up to 100 parts per minute.

**Dr. Jochen Stollenwerk:** At present, thin conductive contact layers of less than 10  $\mu\text{m}$  in thickness are usually applied using electroplating techniques or by means of physical or chemical vapor deposition. These methods are costly in terms of energy, money and time and, in some cases, are also harmful for the environment. What is more, application using these methods is not selectively localizable and they therefore consume large quantities of precious metals. At the same time, the market for contacts is becoming ever more differentiated, i.e. contacts must increasingly be customized for each individual application. This means that even though the total parts



► volume remains the same, the volumes per variant are falling, development times are shortening and the pressure of competition is increasing. The InKonMass procedure provides an innovative way for the inline production of contacts that not only permits resource- and energy-efficient manufacturing through selective application but also responds to the trend toward customization.

**b. on top: How does the new inline contacting process actually work?**

**Professor Loosen:** A multistage procedure is used to apply the precious metals or precious metal alloys in the form of nanoscale or microscale particles in emulsions to the component for coating. Printing and dispensing methods are used for the selective, localized application of the emulsions. What is common to all the layers manufactured in this way is that the applied materials have to undergo subsequent thermal treatment in order to achieve the desired functionality. Important steps here include the drying or evaporation of the solvent as well as melting or sintering. Using laser radiation, this can be done with extreme precision while also imposing only a low thermal load on the substrate.

**Dr. Jochen Stollenwerk:** And the procedure is not only limited to flat

substrates but can also be used for free-form surfaces. By adapting the process parameters, it is possible to customize the contact geometry and layer thickness individually to respond to the needs of each individual application. The use of emulsions also offers a very high level of flexibility at the level of materials selection and even permits the in situ manufacture of the material from individual components and master alloys during the laser process itself.

**b. on top: What are the advantages of the new procedure?**

**Mathias Bihler:** For the first time, this approach permits the inline drying and functionalization of printed gold layers in narrow contact cross-sections by using laser radiation during the stamping and forming process. All the processes and modules are integrated in a single, end-to-end process chain and consequently permit a seamless overall manufacturing process with extremely high throughput.

The selective coating procedure is resource-efficient and cuts down on high precious metal costs. At the same time, energy consumption is reduced through the elimination of the electroplating and oven processes. The process for manufacturing electric contact elements is shortened and can be designed more flexibly, which is of particular importance when used in combination with low-run products.

**Dr. Jochen Stollenwerk:** At the same time, it is possible to

**Professor Loosen:**  
"A CRUCIAL FACTOR FOR SUCCESS – IN PARTICULAR WHEN THE EXCHANGE OF KNOWLEDGE AND PROCESS TECHNOLOGY IS INVOLVED – IS A HIGH LEVEL OF MUTUAL TRUST AND CONFIDENCE."



develop precious metal alloys with a reduced proportion of high-cost elements but which nevertheless exhibit the same properties. This can result in additional cost savings.

**b. on top: What tasks are the project partners performing and what is the role of Otto Bihler Maschinenfabrik?**

**Professor Loosen:** The overarching aims of the project can only be achieved if a range of skills from all along the value chain interact within the collaborative project. Alongside the Fraunhofer Institute for Laser Technology (ILT), the project involves Otto Bihler Maschinenfabrik, Phoenix Feinbau, Phoenix Contact, Heraeus, SPI, and Trumpf. Otto Bihler Maschinenfabrik has a central role to play because it is developing the system technology required for the integration of the coating and laser system in a continuous process chain. The intention is to construct a demonstration system on the basis of the newly developed solutions and to work together with the project partners to conduct a series of tests, with the ultimate aim of optimizing the overall process and its individual components, as well as the achievable process times and other process parameters.

**Mathias Bihler:** The project has a number of different working aims:



**Mathias Bihler, Partner and Managing Director of Otto Bihler Maschinenfabrik:**  
"ALL THE PROCESSES AND MODULES ARE INTEGRATED IN A SINGLE, END-TO-END PROCESS CHAIN AND CONSEQUENTLY PERMIT A SEAMLESS OVERALL MANUFACTURING PROCESS WITH EXTREMELY HIGH THROUGHPUT."

The objective is to manufacture contacts which possess the required properties in terms of electrical conductivity, adherence, wear and corrosion. At the same time, the process sequence for the drying, sintering and fusing of the layer by means of laser postprocessing also has to be developed.

Our aim is to integrate the system and develop a demonstration version and in this way to prove the process capability of the individual technologies developed as part of the joint project as well as by the various partners to it. The most important thing here is to examine and demonstrate the interaction of the individual system modules and manufacturing steps involved in the production of selectively coated contacts in the light of the required, targeted throughput levels. In addition, it will be necessary to analyze the flexibility of the technology used to apply different coatings on different contacts and analyze the associated quality.

**b. on top: On what Bihler system will the technology be implemented?**

**Mathias Bihler:** System and process integration will take place on the BIMERIC BM 4500 servo-controlled production and assembly system. A particular advantage here is the system's modular structure which permits the flexible arrangement of the different processes. The individual modules comprise pre-stamping, coating, drying, stamping, forming, assembly, and laser joining. Alongside the standardized Bihler modules, the VC 1 control platform, which provides the complex interface function for the overall process, also plays an important role. The BIMERIC BM 4500 makes it possible to design a complete system to meet the project objectives, from the semi-finished product made from strip material through to the finished product. As a result, it provides all the prerequisites necessary for achieving our main goal, namely the laser-based inline manufacture of conductive contacts on stamped parts at a throughput of up to 100 parts per minute.

**b. on top: What potential for future success will the new procedure open up?**

**Dr. Jochen Stollenwerk:** The planned new, energy-efficient, resource-saving procedure has considerable potential for application, in particular in the field of individual parts that are produced in smaller volumes of less than one million parts per year. The prospects for economic success if the project results are successful seem to be extremely good. This is due to the high energy and resource-efficiency, the excellent versatility and selectivity of the laser-based approach, the high material efficiency and the inline capability of the procedure, as well as the resulting shortening of the process chains. Initial estimates assume that in the light of the targeted benefits compared to conventional procedures, it will be possible to achieve cost savings several times greater than the one-off project costs.

**Mathias Bihler:** The replacement of electroplating and the provision of this cost-efficient procedure for the manufacture of custom components will bring about significant competitive advantages because no such procedure exists at present. These competitive advantages can also be exploited to re-establish the competitiveness of manufacturing of contacts in the German market compared to competitors from low wage countries. This shows that research projects such as InKonMass are particularly important today. This is because they not only extend Germany's strengths as a center of knowledge and expertise in the long term but also improve its overall economic status and secure employment for the future.

**Professor Loosen:** Innovative research projects such as "InKonMass"

are based on intensive collaboration between the industrial and research sectors. A crucial factor for success – in particular when the exchange of knowledge and process technology is involved – is a high level of mutual trust and confidence. And especially in the case of Otto Bihler Maschinenfabrik, this is something that has been built up over many decades. This ensures the progress of our joint efforts and creates genuine competitive advantages – for the long-term success that benefits all of us. ■



**Dr. Jochen Stollenwerk:**  
"THE NEW, ENERGY-EFFICIENT, RESOURCE-SAVING PROCEDURE HAS CONSIDERABLE POTENTIAL FOR APPLICATION, IN PARTICULAR FOR INDIVIDUAL PARTS THAT ARE PRODUCED IN SMALLER VOLUMES."

CAMS ETC.

# FUNCTION CHART



The function chart defines the sequences of movements of all the different units. In the case of mechanical stamping-forming machines (on the left in the photo), it forms the basis for the production of cams. It is the controller that is responsible for adjusting and optimizing movements in servo-controlled production systems (right).

The function chart defines the travel profiles of all the tools as a function of their movements. The starting point is a full machine revolution through 360 degrees. This radius is available for all tool movements and corresponds to one full machine cycle. Depending on the movement of the tool, the 360 degree machine angle is subdivided into different individual sections. These include all the angles of ascent and descent as well as the angles for which the forming units do not move. Although, for the sake of simplicity, the ascents and descents are displayed as straight lines, they are actually sinusoidal movements.

## Mechanical machines

In the case of mechanical stamping-forming machines, the function chart forms the basis for the manufacture of the cams. The cams transform the rotational movement of the gear wheel at the machining units into a linear movement. In this case, the geometry of the cam determines the speeds, accelerations and inertial forces to which the tool is subjected. The form of the transitions at the cam curve directly influence the smooth running and therefore also the performance of the machine.

## Servo-controlled production systems

In contrast to the cams used in mechanical stamping-forming machines, the movement sequences at servo-controlled production systems can be adjusted and optimized quickly, simply and directly via the controller. To do this, it is sufficient to enter the axis movement data in the controller's corresponding, clearly structured menu screens. The maximum force can be produced at any time and in any stroke position and forming movements are possible with constant power transmission. The result: Strip and wire material is machined at the optimum speed at all stations. ■



## NEW WELDING TECHNOLOGY SEMINAR

# MORE EFFICIENT WELDING

Resistance welding is a fascinating technology – and one that has numbered among Bihler's core skills for more than 40 years. To ensure that all users of Bihler welding technology are always aware of the latest advances and are able to operate their systems efficiently, the training team passes on its extensive knowledge in practical seminars. The new application-oriented welding technology seminar (consulting) is intended for qualified employees from the fields of production, toolmaking and design. Employees receive support and training – which can also be provided on-site – in questions or

problems relating to the theory or practice of all aspects of resistance welding. To enable us to design our seminars efficiently, we require individual information from every participating company two weeks before the start of the event. This includes information on the type and scope of the application(s) together with the corresponding parts and the system and tools used. In addition, any difficulties encountered should be indicated to help the speaker and a contact person for the speaker should also be designated prior to the event. The maximum number of participants permitted at

the new welding seminar is eight.

All the information on this individually designed seminar, together with the application form, can be found on [www.bihler.de](http://www.bihler.de) → SUPPORT → Seminar calendar. ■

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## B. ON TOP HIKING TIP

# ON THE SÄULING!

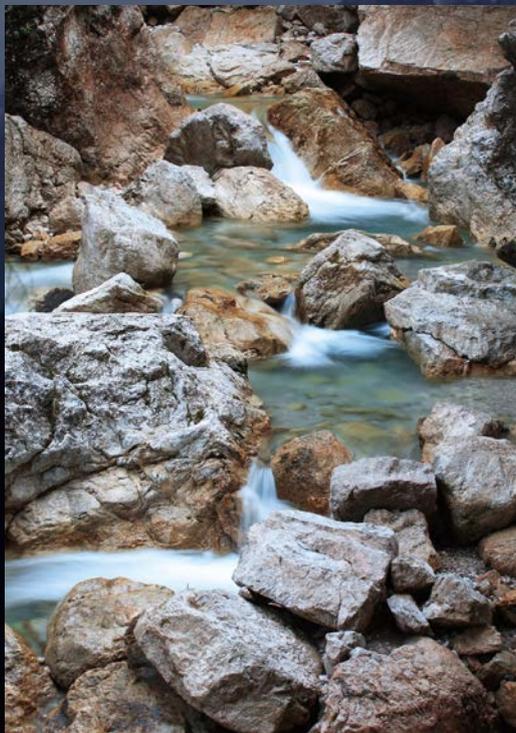
At 2,047 meters, the Säuling towers imposingly above Neuschwanstein and the waters of the Alpsee. This varied mountain hike of approximately three hours takes walkers to the summit with its wealth of breathtaking panoramas. After welcome refreshment in the Säulinghaus mountain hut, the path down through the untamed Pöllatschlucht concludes this unique excursion.

In close proximity to Otto Bihler Maschinenfabrik in Halblech, visitors will find one of Bavaria's greatest tourist attractions perched above Hohenschwangau near Füssen: Neuschwanstein castle. Every year, more than a million visitors make the pilgrimage to this very special bit of history that Ludwig II left for posterity. This famous, unique construction is renowned for its white towers as well as for the imposing mountain scenery that surrounds it. And in this landscape, the 2,047 meter high Säuling with its bright domed summit flanked by steep rocky inclines undoubtedly lords it over all the other peaks.

### The starting point: the King's hunting lodge

The King climbed the Säuling when he was still a young man and often stayed in the royal hunting lodge. This is located in the Pöllattal just a few kilometers from the castle and

makes the perfect starting point for a tour of the Säuling. Nowadays the Bleckenau mountain restaurant, it is easily reached by taking the shuttle bus from Hohenschwangau. Leaving the restaurant, a well-marked path leads for about half an hour through the mountain woodland before turning off diagonally for a while along the rocky base of the Säuling.



Here you will get your first view of the royal castle – very unusually, by looking down on it.

### Along secure routes to the summit

The path then leads through light rocky terrain ever upwards toward the lower peak. Even though there are no unsurmountable obstacles here, it is still necessary to tread with care and to have no fear of heights. In addition, the more demanding stretches are well protected with wire ropes. With a little luck, you may also get to see chamois and ibex in this light, rocky landscape.

These elegant climbers feel particularly at ease in this bare, stony landscape and roam throughout the entire area. After passing through the rocks, you reach the flat saddle of the lower peak. It is here that the mountain's name also becomes clear because the peak rises above its surroundings like a vast stone column ("Säule", in German means column or pillar). On reaching the lower summit, the view opens up immediately, offering spectacular views down into Reutte's basin-shaped valley and on into the mountains beyond. After



a final rise, you reach the summit of the 2,047-meter high Säuling after a hike of approximately three hours.

#### A view worth the effort

At the cross that sits at the top of the summit, the particular attraction of the Säuling becomes apparent in the form of a spectacular all-round panorama. You can see the wide mountain range around the Zugspitze as well as the river Lech which winds snakelike down from the mountains. You can gaze at the peaks of the Lechtaler and Allgäuer Alps or, on clear summer days, at the far-away Wildspitze. If you look down into the valley to the north-east, you will see the Ammersee and Starnbergersee lakes in the distance. After ascending the summit, the journey continues downhill to the west. At the top of the saddle, the path comes to a T-junction where you turn south-

From the peak at over 2,000 meters, visitors enjoy a spectacular view of the Hohenschwangau castle and Neuschwanstein castle and the neighboring lakes (right). The return path also leads through the untamed Pöllatschlucht (left).

ward to enter Austrian territory. After a beautiful, but steep though well-protected descent, hikers are greeted by the Säulinghaus, situated at an altitude of 1,694 meters. This hut has been run for over 25 years by Sepp Rieger who takes great pride in nourishing weary walkers with food and drink.

#### Excursion to the Stollen

When you have regained your strength, the path takes you around the Pilgerschrofen and back onto Bavarian soil. Here you can head off toward the Älpeleskopf to reach,

in about five minutes, the so-called "Mangstollen" (to the left approximately 20 m below the ridge). In the past, iron ore was mined here before being processed to obtain iron in the smelting works in the valley – approximately where the Bihler company site now stands in Halblech. You now return to the main path which descends toward Bleckenautal. The conclusion to this exceptional mountain excursion is a stretch of path through the unimaginably romantic Pöllatschlucht, past waterfalls and outcrops of rock before you once again arrive in Hohenschwangau. ■



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**BIHLER**



THE MAGAZINE OF  
OTTO BIHLER.  
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2014

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**Please send me information about:**

- NEW BIMERIC SP** (Servo-controlled production system consisting of servo-controlled press and BIMERIC solution platform)
- NEW RM-NC and GRM-NC** (Servo-controlled stamping-forming machines)
- NEW BIMERIC BM** (Servo-controlled production and assembly system)
- NEW B 5000-NC** (Multipurpose welding system)
- VariControl VC 1 (Machine and process controller)
- RM series (Mechanical stamping-forming machines)
- GRM series (Mechanical stamping-forming machines)
- NC process modules (Contact welding units, tapping units, multipurpose screw insertion units, etc.)
- Bihler's bNX technology software
- Bihler support: "bihlership"

**Contact request:**

- I would like a Bihler sales representative to contact me.

Sent by:

Company

Last name, first name

Function

Street / PO box

ZIP code, city

Phone, fax

Email

- Please send a copy of "b on top" to:**

Company, last name, first name

Street / PO box

ZIP code, city