b on top

THE MAGAZINE OF
OTTO BIHLER
MASCHINENFABRIK
GMBH & CO. KG
2023

THE HUMAN AS THE SUCCESS FACTOR

The human as the success factor

Ultimately, it is up to the driver – he is in control, he pulls off the victory. But where would he be without his team to support him and the equipment that helps him on his way? Just as in motor racing, the challenge in the private-sector economy is to triumph over the competition. And here again, people play a pivotal role in securing the success of their businesses. This magazine examines the support they find in reliable partners and innovative technologies.

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

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“THE ONLY WAY TO STAY SUCCESSFUL IN THE FUTURE IS TO ACTIVELY ADDRESS THE TASKS OF THE PRESENT.”

The world is changing and the metalworking industry, in particular, is faced by ever more complex tasks. These include changing market requirements, personnel shortages, high raw materials and energy costs, as well as increasingly stringent climate and environmental protection regulations, inflation and global conflicts.

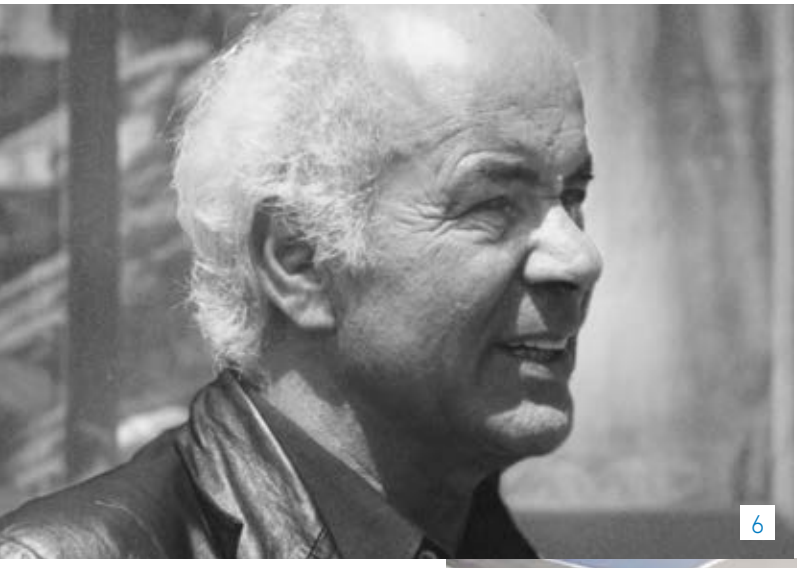
All companies have to come to terms with the consequences of this change The challenge is to react to changing markets, to make the best possible use of the available resources and to efficiently exploit the available potentials for optimization. The only way to stay successful in the future is to actively address the tasks of the present.

The many different custom portraits in this edition of *b. on top* illustrate how people and companies are reacting to the current situation as well as the specific solutions they are implementing in response to it. With Bihler, they have chosen the right course towards a successful future and, as a reliable partner, we support them with high-performance solutions, products and services.

In doing this, our aim is always to offer you, our valued customers and partners, maximum value added in your production operations and to strengthen your competitiveness in the global market. We have been doing this successfully for the last 70 years and, on the occasion of this anniversary, I should like to thank you most sincerely for your continuing trust and confidence. We hope you enjoy reading the current edition,

Mathias Bihler,
Managing Partner

b.on top 2023



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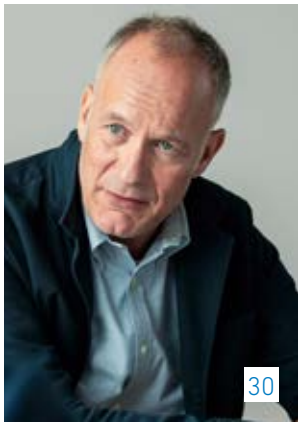

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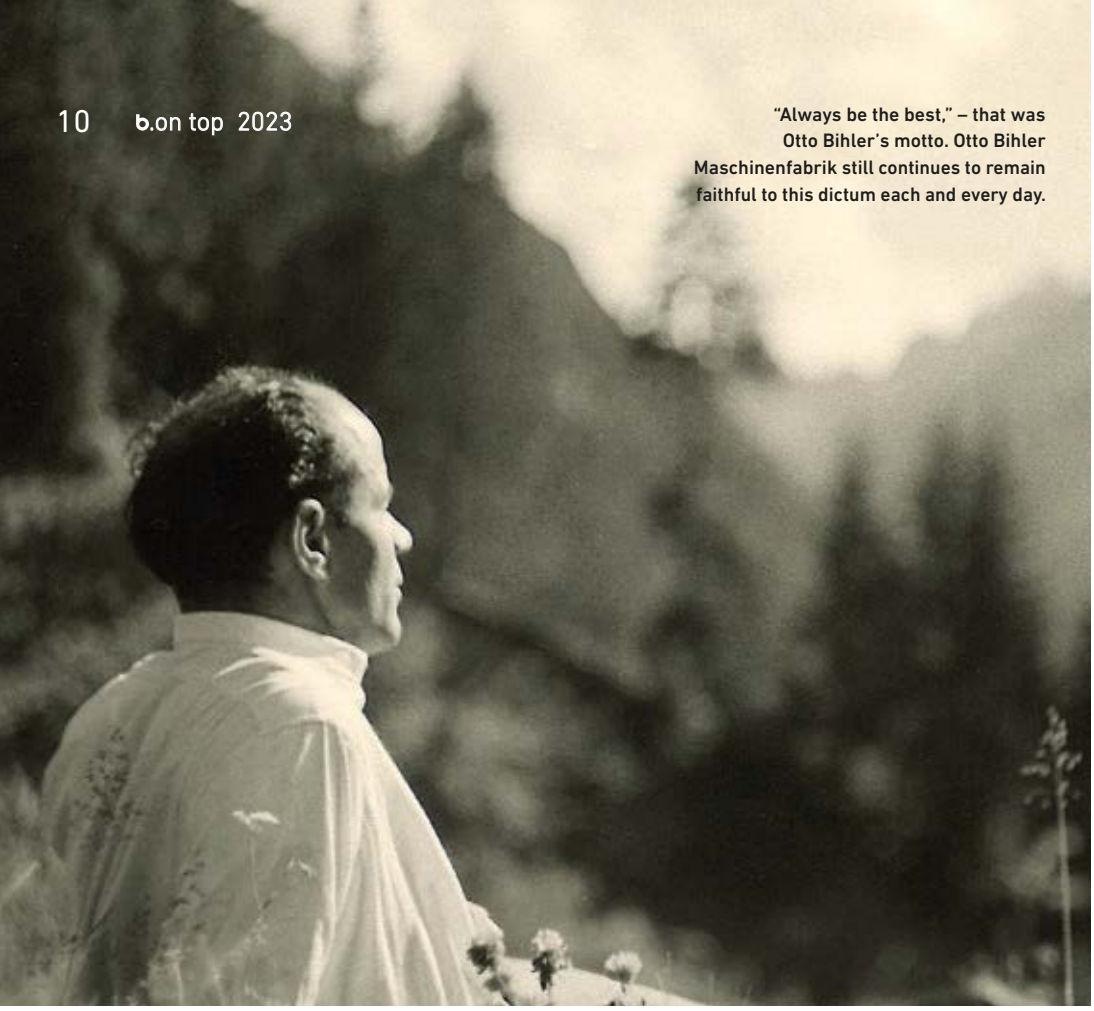
FROM VISIONARY ...

... TO GLOBAL MARKET LEADER

To constantly extend the boundaries of what technology can do and revolutionize the market with genuine innovations – for 70 years, that has been the secret behind the success of Otto Bihler Maschinenfabrik. And as a prestigious global systems supplier of forming, welding and assembly technology, Bihler continues to rely on its great innovative strengths to extend its technological leadership today.



"Always be the best," – that was Otto Bihler's motto. Otto Bihler Maschinenfabrik still continues to remain faithful to this dictum each and every day.

Like all great success stories, that of Otto Bihler Maschinenfabrik starts out small. Very small in fact. Because Otto Bihler did not have much when he founded his company in 1953: Just a tiny workshop in Pfronten and a dream – that of revolutionizing the world of stamping-and-bending technology with completely new, innovative manufacturing solutions. This is the background to the birth, in 1953, of the UFA 1 spring winding machine followed, in 1956, by the development of the legendary RM 25, the world's first stamping-and-bending machine for the mass production of parts made from wire and strip material. These were genuine innovations that made it possible to manufacture what were, for the time, highly-complex components quickly, reliably and economically on a single machine. The systems were ideal for meeting the enormous demand for new machine technologies in the post-war period and, during the years that followed, Otto Bihler Maschinenfabrik continued to launch further innovations that responded precisely to its customers' needs. Thus, the first MACH machines, which were able to produce up to 1000 parts per minute for the first time, were developed in 1970. At the same time, Bihler integrated new value-added processes such as welding, thread cutting and screw insertion in its manufacturing solutions. This allowed users to benefit from the cost-effective production of increasingly complex stamped-and-bended parts and assemblies. 1983 saw the arrival of the first BZ linear forming and processing center, which laid the foundations for the efficient manufacture of assemblies. Bihler of America was founded in 1986 and, in the following year, Otto Bihler Maschinenfabrik launched the world's first design software for stamping-and-bending technology.

Be the best All the systems and innovations from the early years laid the foundations for the success of Otto Bihler Maschinenfabrik, which has now become the world's leading supplier of forming, welding and assembly technology, with a workforce of approximately 1000 employees, three principal sites, and agencies in more than 35 countries. However, the first machines and developments also testify to the very special innovative and pioneering spirit of the founding father: "Otto Bihler was a true pioneer and visionary who never lost sight of his customers' needs, constantly pushed back the limits of what technology can achieve and worked with great determination, skill and commitment to make his dream come true," recounts Mathias Bihler. "His motto was: 'You can only thrive in the market by being the best', and we continue to remain true to this dictum each and every day."

A new chapter Just as in the early days, drive, expertise and continuous further development still reflect the "spirit" of the company today and are deeply rooted in Bihler's DNA. This is particularly – and almost literally – true for Mathias Bihler, who took over the management of Otto Bihler Maschinenfabrik in 1991. Indeed, he grew up at the factory site and therefore right in the middle of the fascinating world of stamping-and-bending technology, which he got to know inside and out from an early age. His enthusiasm for systems technology and love of practical manual work allowed him to successfully complete his training as a toolmaker in his father's business. After this, he worked in the USA as well as in the Füssen plant, taking on roles in Production, Programming, Assembly and the Welding Laboratory – before completing another training course and working for a further two-and-a-half years in the Bihler Design department. After this, Mathias Bihler moved into technical sales and contributed considerably to the successful marketing of Bihler technology, in particular in Asia and Europe.

Continuous development The next pioneering Bihler innovations then appeared under the guidance of Mathias Bihler as Managing Director. These included, for example, the introduction of the FMS assembly system in 1993 and the series of Multicenter machines in 1999. Further milestones were achieved in 2004 with the RM 40K stamping-and-bending machine and in 2006 with the GRM 80P series. At the same

time, Otto Bihler Maschinenfabrik was already working on its next technological revolution, namely the introduction of NC technology for stamping-and-bending machines. Thus the servo-controlled Bihler BIMERIC forming system saw the light of day in 2000, while the innovative BIMERIC BM NC production and assembly system was developed in 2010. Other milestones took the form of the introduction of the Bihler LEANTOOL system for tool production and the focused development of digital tools and services. The most recent highlights in the Bihler system portfolio consist of the RM-NC and GRM-NC servo-controlled stamping-and-bending machines, followed by the LM 2000-KT/-NC linear machines. Since fall 2022, these systems have once again been opening up completely new dimensions in manufacturing for all users.

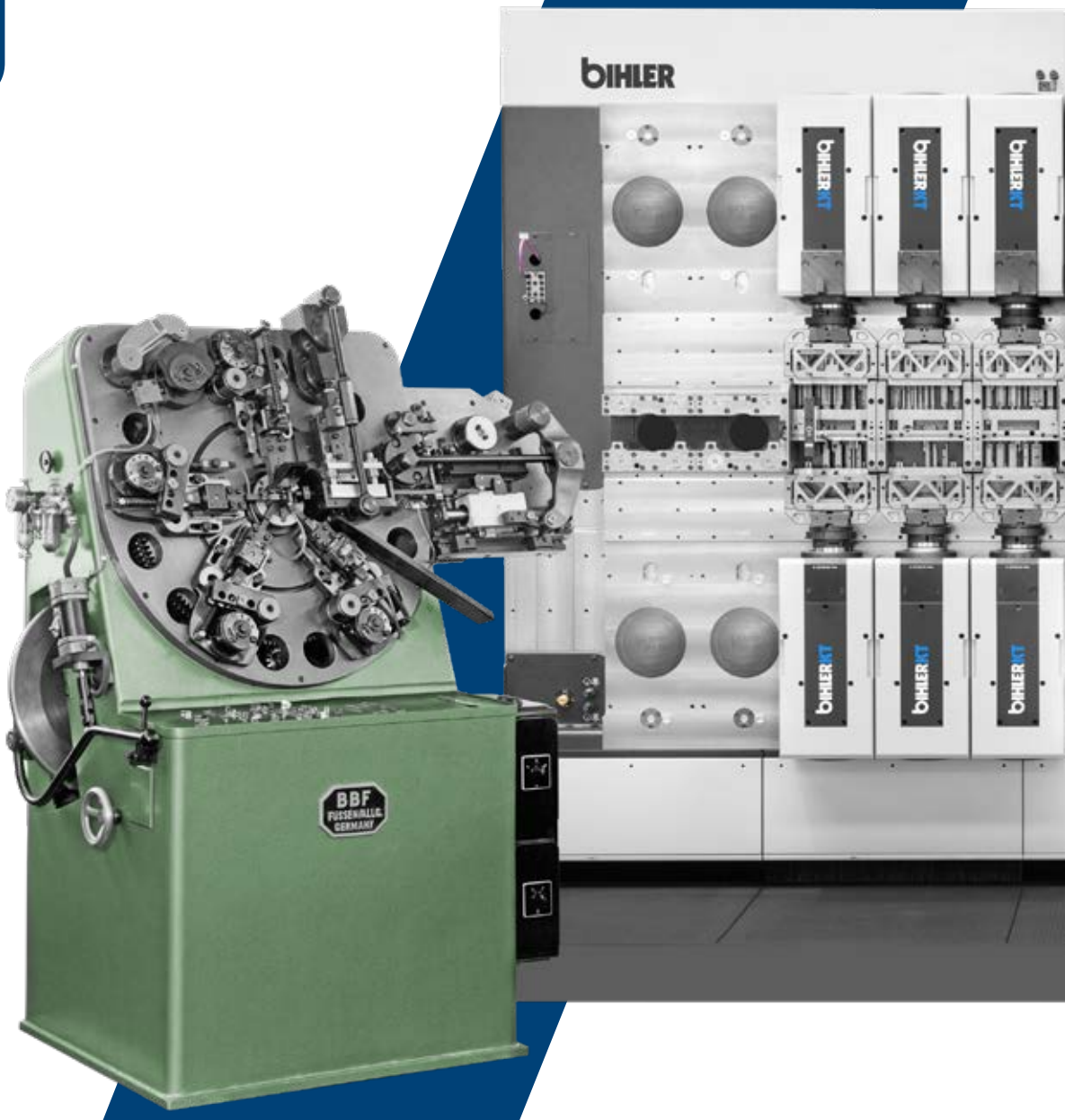
Solutions from a single supplier The systems that have been developed over the decades form the basis for Otto Bihler Maschinenfabrik's success. However, the company does much more than simply supply the machine: "Bihler offers everything from a single source – from high-performance production systems, process modules and peripheral devices for greater operational versatility on to end-to-end automation solutions. All the modules are perfectly harmonized with one another and guarantee outstanding production quality and success for our customers," is the clear message reiterated by Mathias Bihler, Bernd Haussmann, Manfred Grundner and Martin Niklas, who make up the current Bihler Managing Board. True to this approach, Bihler provides its customers with all-round support, from the initial query through planning and design of the system and on to live production. And even beyond this, Bihler's support staff are available to give active assistance whenever it is needed.

Both global and regional Otto Bihler Maschinenfabrik has so far successfully completed more than 12,000 customer projects. The products manufactured on these solutions can be found in practically every sphere of life. In this way, Otto Bihler Maschinenfabrik makes a significant contribution to social well-being in every part of the world. However, Bihler has also long played a role in social affairs in its native region. On the one hand, this includes ensuring the availability of the workforce of tomorrow. For example, Bihler has so far trained over 1,500 apprentices in the company. On the other, Bihler is deeply committed to social projects such as the Halblech ski club youth center, the Kinderkrebshilfe Königswinkel child cancer center or the Allgäu Orient Rally. The company also likes to help in the academic field. Thus, for example, Bihler has provided both Munich Technical University and the Kempten University of Applied Sciences with a new stamping-and-bending machine.

Optimistic about the future This year, Otto Bihler Maschinenfabrik is celebrating its 70th anniversary. Everyone who has been part of this journey can experience this anniversary with pride and contentment, because it is they who, with their commitment, their knowledge and their hard work, have made it possible for a small backyard workshop to develop into the world's leading system supplier of forming, welding and assembly technology. And Bihler has also remained true to itself on its path through this success story: "Otto Bihler's guiding message, namely the need to constantly extend the boundaries of what technology can do and offer the market pioneering products, remains at the heart of our success strategy today and will continue to do so in the future," that is the unanimous opinion of the Bihler Managing Board. "We work with determination and a commitment to innovation to further extend our technological leadership and offer our customers the outstandingly cost-effective, high-tech manufacturing solutions that will continue to ensure our shared success in the future." It is market and customer requirements that will determine what direction the journey takes in the years to come. But for Mathias Bihler, one thing is clear: "With our strong team, our modular and standardized machine and tool technology, our pioneering automation solutions and digital services and our tailored support services, there can be no doubt that we are optimally prepared for all the tasks the future holds for us and we are looking forward to it with optimism. In this way, we will be able to give our customers the best possible support as they prepare their own futures. This is as true for today and tomorrow as it has been for the last 70 years." ●

Bihler's current Managing Board with Mathias Bihler as Managing Partner (2nd from left), Bernd Haußmann, Manfred Grundner and Martin Niklas (from left to right).

BIHLER TECHNOLOGY



1953 – 2023

Otto Bihler starts off by manufacturing springs and builds his first UFA 1 spring winding machine.

1953

The Bihler modular system with welding and assembly capabilities is developed on the basis of the RM 35 and GRM 50 stamping-and-bending machines.

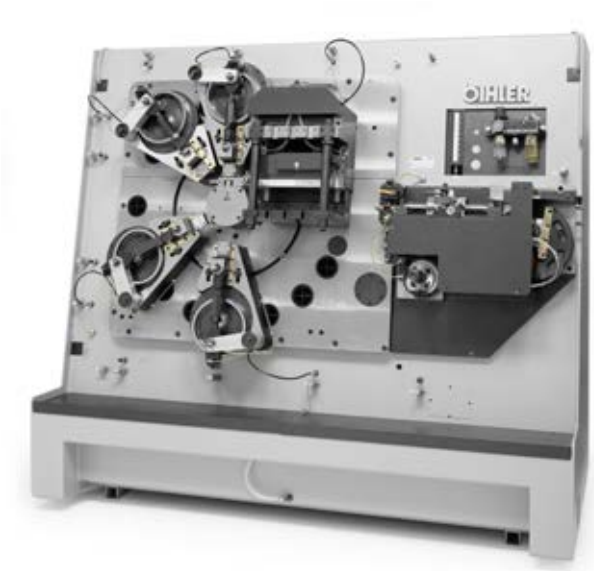
1966

1956

Development of the world's first RM 25 stamping-and-bending machines for the production of mass parts made from wire and strip material.

1970

With its MACH machines, Bihler breaks the sound barrier for the first time by achieving output of up to 1,000 parts per minute.



The first BZ linear forming/processing center provides the basis for the efficient manufacture of assemblies.

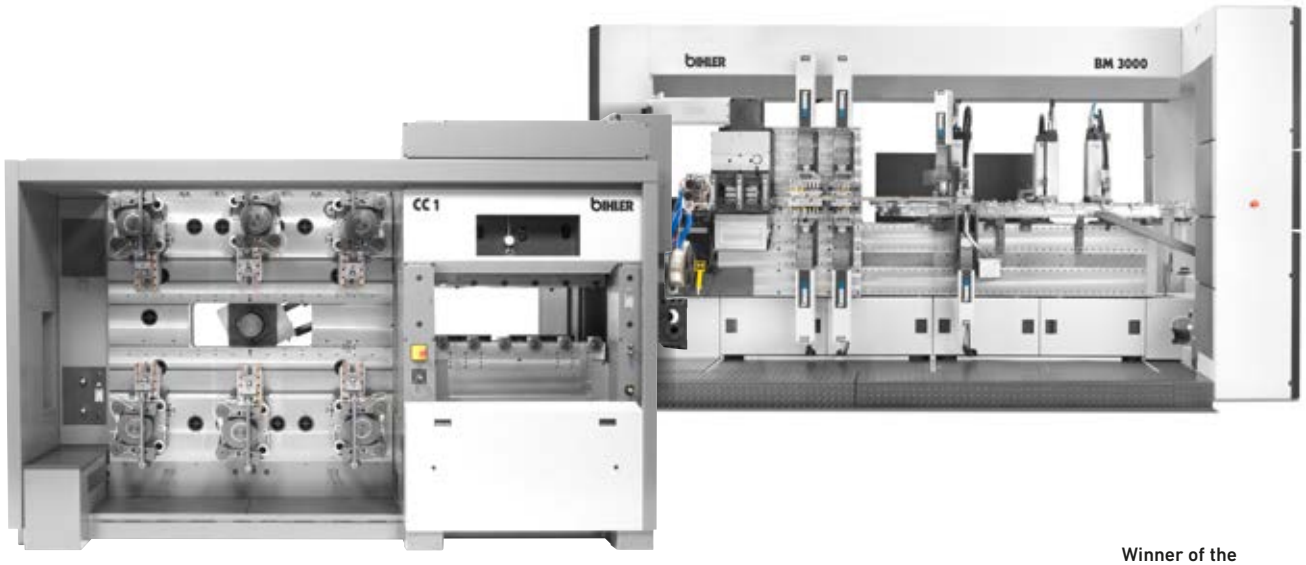
1983

NC technology starts to take hold in Bihler with the BIMERIC servo-controlled forming system.

2000

1993

The versatile FMS assembly system brings a new dynamic to Bihler application technology.



The powerful COMBITEC CC 1 forming center is the perfect machine for handling large components.

Winner of the EuroBLECH Award: The innovative BIMERIC BM NC manufacturing and assembly system.

2005

2010

2004

The new RM series permits the exceptionally efficient mass production of stamped-and-bended parts.

2006

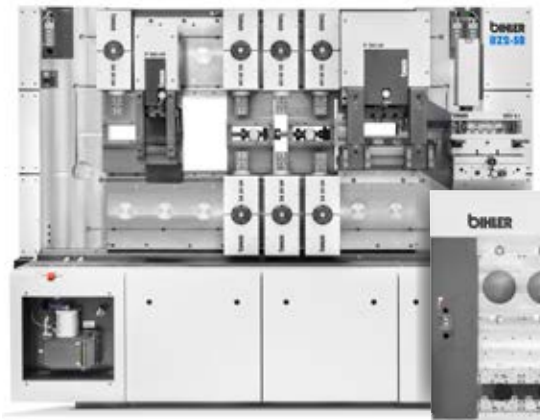
With the GRM 80P stamping-and-bending machine, users benefit from even greater manufacturing freedom.

With the BIMERIC SP servo production system, Bihler opens up new possibilities for the production of assemblies using progressive manufacturing technology.

2015

2013

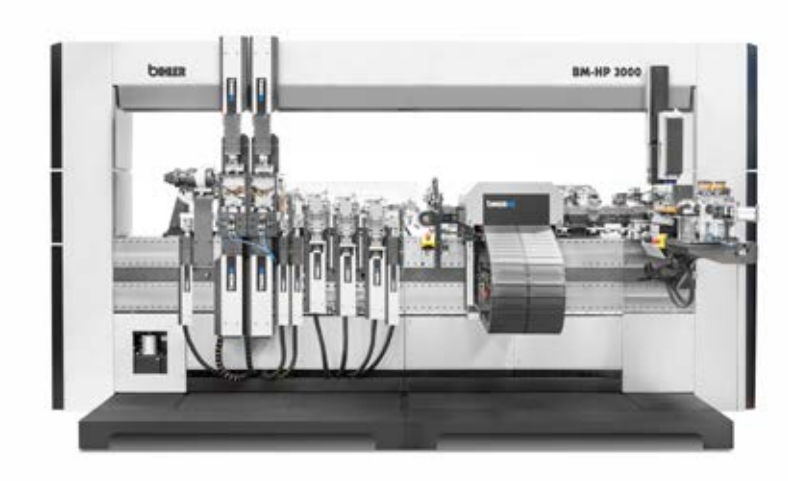
Ideally prepared for the tasks of the future with the servo-controlled RM-NC and GRM-NC stamping-and-bending machines.



2018

The high-performance BZ2-S8 production system permits the mass manufacture of stamped-and-bended parts and complete assemblies at speeds of up to 700 parts per minute.

2020



With the BM-HP 3000, Bihler offers a highly-automated solution for the manufacture of hairpins for electric motors.

2022

The LM 2000 is the latest Bihler innovation. This linear machine is available as a cam-controlled (KT) and servo-controlled (NC) variant.

COLLEAGUES REMEMBER

Johann Riedhofer was one of the first people to be employed at Bihler and, starting in 1956, worked for 44 years in the toolmaking department.

How did the Otto Bihler Maschinenfabrik success story begin? What was the working world of the time like and what was the atmosphere in the company? Here, four former employees look back on the decades they spent at Bihler.

Wilhelm Riedel

A SPONTANEOUS DECISION

I actually wanted to become a clockmaker In summer 1961, I went for an interview at a firm of clockmakers. The working conditions I found there were not to my liking and so I set off home again a little disillusioned. On the way, it suddenly occurred to me to stop at Bihler. All I knew at the time was that they made some machines or other. The Bihler representative at the time told me that all the apprenticeship places had already been awarded – but for some reason, I was told shortly afterwards that I had been accepted for an apprenticeship, meaning that I was able to start training as a toolmaker at Bihler in 1961. After that, I became a technical draftsman and then a technical salesman. On the one hand, the early years were characterized by the friendly, family atmosphere in the company, which in those days was still small and employed around 70 people. On the other, those days also bore the stamp of Otto Bihler's visionary, forward-looking spirit. However, right from the beginning, he always took particular care to archive all the company's knowledge and experience so that it was always available. Bihler still possesses this treasure trove of experience today. But just as important for the company's continuing success was the fact that, despite the constant technological advances and the new digital resources, we never lost or forgot the value of simple, logical thought. I am very happy to have been able to be part of this success story and wish the company the very best for its 70th anniversary.

Wilhelm Riedel worked at Bihler from 1961 to 2013 and, as a technical salesman, was primarily responsible for Sweden, France and Italy.

Johann Riedhofer

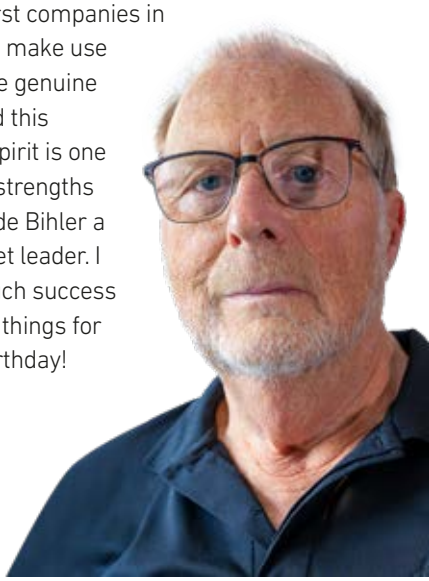
THERE FROM THE VERY BEGINNING

In the early 1950s, I was working in a building and artistic metalworking shop in Füssen and that's where I got to know Otto Bihler. I welded the subframe for his first spring winding machine for him. He was very pleased with my work and straightaway asked me whether I'd like to come and work for him and his company. The offer attracted me and just a short time later I was indeed making my way to him in Pfronten. He said: "Oh, here you are!" – just as if he'd been expecting me. On the very next day, 28th June 1956, I started my work and then stayed at Bihler for the next 40 years. The early years saw a lot of ups and downs and we were faced with a host of new challenges every day. At the same time, however, the first years and decades were characterized by the friendly atmosphere that reigned throughout the entire company. We also did a lot together outside of work. For example, we would all get aboard the company bus on a Saturday and go on a skiing excursion together! Those were good times and the work was also always a lot of fun. I'm still in close contact with the company and Mathias Bihler today and that's something I'm very happy about. All the best for the 70th anniversary!

Jürgen Cramer

BIHLER AS PIONEER

In the late 1970s, I was working in a large photographic products business in Leverkusen and the search for a tape intake solution for an instant picture project brought me into contact with Otto Bihler Maschinenfabrik. This company in the very south of Germany grabbed my interest and so I applied for a job and started work as designer at Bihler in mid-1979. Coming from Prussia, the Allgäu was a very new experience for me! However, one of the most positive discoveries was the shared community spirit that permeated Bihler – for example, the fact that Bihler's employees were picked up by bus, that there was a children's party and a summer party and that the company organized regular ski events. For me, that was something extraordinary and it undoubtedly contributed to the fact that I always felt very happy at Bihler. At the same time, the work was also enthralling. For example, I experienced every step on the journey from the analog to the digital world at first hand and I can still remember when, in 1986, Otto Bihler entrusted two colleagues and myself with the first, for its time completely innovative CAD system. Being a true visionary, he had immediately understood the significance of this technology and so we were one of the first companies in the region to make use of it. We were genuine pioneers and this pioneering spirit is one of the great strengths that has made Bihler a global market leader. I wish you much success and all good things for your 70th birthday!

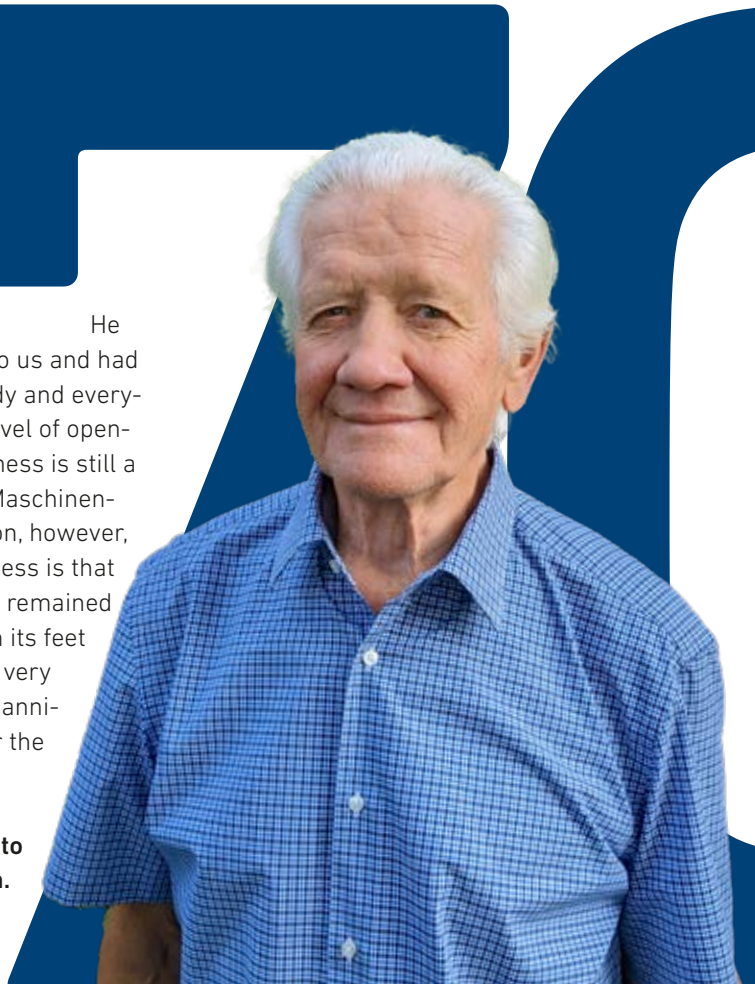


Jürgen Cramer worked at Bihler from 1970 to 2002, most recently as Head of Machine Design.

Kurt Lob

A SPIRIT OF PROGRESS, CARE AND ATTENTION

I joined Otto Bihler Maschinenfabrik in October 1963. Prior to that, I worked for a Swiss mechanical engineering company in Winterthur. That was when I met a friend who told me to go and try my luck at Bihler in Halblech, where they were looking to recruit! No sooner said than done and so I introduced myself to the Bihler HR Manager of the time, Xaver Settele. We very quickly saw eye-to-eye and that's how my professional career at Bihler started. The company's early decades were characterized by Otto Bihler's spirit of progress and his visionary projects. These resulted in genuine milestones, such as the UFA 1 spring winding machine or the BZ-1 processing center, which was presented for the first time at the Paris exhibition in 1982. These systems were revolutionary for their times and they made a decisive contribution to Bihler's growing success. However, equally characteristic of these times were the special care and attention that Otto Bihler paid to his employees. He was like a father figure to us and had an open ear for everybody and everything. This exceptional level of openness, trust and togetherness is still a hallmark of Otto Bihler Maschinenfabrik today. In my opinion, however, the crucial factor of success is that the company has always remained upright, reliable and with its feet firmly on the ground. My very best wishes for the 70th anniversary and I wish Bihler the very best for the future!



Kurt Lob worked at Otto Bihler Maschinenfabrik from 1963 to 2000 and was the Head of Assembly in Füssen.

DISCUSSIONS BETWEEN PARTNERS

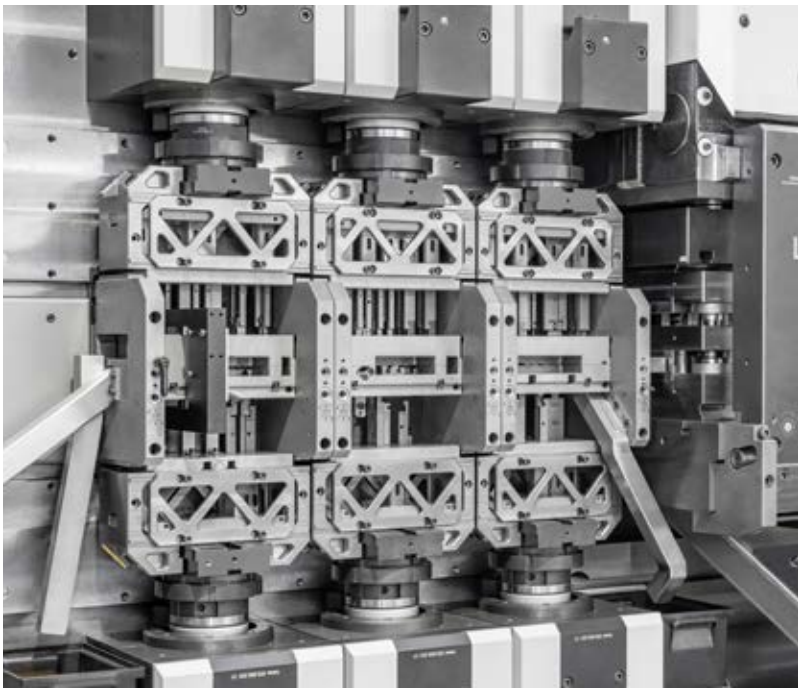
17th July 2023 saw the first joint TechDay held by Bihler and automotive supplier Dräxlmaier at the latter's headquarters in Vilsbiburg, Germany. This long-established company is a successful user of Bihler technology and a good twenty or so participants took advantage of the TechDay to discuss the latest trends and developments. During the event, the Bihler team gave six talks on the benefits of standardization in stamping-and-bending technology and showed how Bihler's own innovations open up new avenues for value creation. The integration of welding techniques in Bihler's manufacturing solutions and the comprehensive service and support offers available to Bihler customers also featured prominently.
For their part, the speakers from Dräxlmaier explained the requirements they place on a machine and systems supplier. At the same time, they gave participants a chance to look ahead at their company's future. Information stands were set up for all of the key points addressed in the presentations and these were the venue for intensive discussions during the breaks. The participants included the virtual reality specialist CMC Engineers, which provided an insight into the digital Bihler world. All in all, the TechDay was a complete success which gave both companies many new ideas and stimuli. "This was the first time that Bihler had organized a TechDay of this level of intensity at a customer site," summarizes Martin Lehmann. "Our conclusions are very positive and we are planning similar events with other customers in the future." ●

50-YEAR SALES PARTNERSHIP

It is not only Otto Bihler Maschinenfabrik that has an anniversary to celebrate this year; the company Sequem in the northern French commune of Lezennes, near Lille, also has a history to be proud of. This is because it has now been working for exactly 50 years with Bihler and has exclusive responsibility for Bihler sales in France, Belgium and Luxembourg. It all started back in 1973 when Jean-Pierre Servaes, the nephew of the company's founder Marcel Servaes, traveled to Halblech to discuss the possibility of representing Bihler in Belgium. This visit was to lead to a 50-year success story and a close relationship between the Bihler and Servaes families.
The company, which was founded in 1947 in Brussels, is now being managed by the third generation of the family in the form of Pierre and François Servaes, the grandchildren of the company's founder, as well as Marie Servaes (from left to right in the photo). They offer their customers and prospects comprehensive consultancy and support – through the offer and award of contract and on to to a range of services to accompany their customers' projects This, combined with the company's decades-long knowledge of the sale of Bihler machines and applications, makes Sequem the ideal partner for all applications involving Bihler technology in France, Belgium and Luxembourg. ●

“EXCEPTIONAL PRECISION”

At Blechexpo 2023, Bihler will be presenting the latest generation of high-precision linear tools for the first time. Marc Walter, Departmental Manager for Design & Development at Bihler, explains the background.



What makes the new linear tools special?

With the new series of tools, it is now possible to manufacture linear stamped-and-bended parts in outstanding precision at throughputs of up to 500 parts per minute. In particular, this is due to the extremely high-strength bending modules Even under extreme loads, that is to say when subject to simultaneous or successive forces acting from above, below and the side, the offset of the tool to the machine never exceeds 0.022 millimeters even at variable operating speeds This results in a forming process of outstanding and unvarying precision which consequently needs no iterated optimization runs The tool series has been primarily designed with the Bihler LM 2000-KT in mind but also runs on all machines that use the LEANTOOL L250 modules.

What material thicknesses and processes have the new tool modules been designed for?

Unlike LEANTOOL, which has primarily been designed for bending strips of 0.3 to 2 mm in thickness, the new tool modules are intended for strip thicknesses of 0.1 to 1.0 mm and a particularly wide range of applications. In addition to edge bending, the tools also offer die-bending, die-crimping, roll bending, bend straightening and coining, as well as embossing, collar forming, extrusion, pin pressing, cutting and separation for the detachment of the finished parts. The tool frame has been redesigned to ensure that the active tool element offset, which is crucial for precision, does not exceed 0.01 mm and in general depends only on the manufacturing tolerance of the EDM machine. As a result, the accuracy of these modules, which have been designed to move in three directions, is every bit as good as that of the most precise, single-action cutting tools At the same time, the modules have been designed as an open system and permit the reliable use of Bihler linear tools.

How are the tools used in practice?

The new bending modules can be set up very quickly and 100 percent reproducibly because they have standardized interfaces and zero-point clamping systems with automatic clamping function. In the same way as for the LEANTOOL L250, the module is simply set up as a complete unit in order to minimize machine stoppages. The fact that both tool and machine share the same interface standard means that the setup operations remain the same at the different machines and ensures a constant design standard. This also increases the level of standardization. The starting point is a design template similar to LEANTOOL L250 in the framework of the bNX software in Siemens NX. ●

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WHAT MAKES YOU SUCCESSFUL?

THE INDIVIDUAL MAKES THE DIFFERENCE!

Human beings are the crucial factor when it comes to creating value-added and ensuring a company's success. However, they need the right partner – one that is able to provide comprehensive support and deliver the technologies that are vital for meeting their own specific requirements. Together, they are able to give life to large-scale, pioneering projects and rise to the many tasks currently facing the metalworking industry.

The steel and metalworking industry in Germany numbers around 5,000 companies employing a workforce of approximately 500,000. The industry is one of the country's ten largest economic sectors and is characterized by an extremely high proportion of mid-sized businesses. It is responsible for machining some 20 million tonnes of steel per year and generates turnover of approximately 80 billion euros. Employees play a central role in all this: They form the backbone of any company and are the most important factor in creating value-added and ensuring commercial success. Thus the employees in metalworking companies bring with them broad-based technical expertise, often coupled with many years of experience. They have a precise understanding of the different working processes, methods and materials and are therefore able to work with efficiency and precision to manufacture high-quality products. However, they also play a crucial role in increasing manufacturing efficiency. This is because they are deeply familiar with the machines and tools and know how to use them to the best possible effect. In addition, employees are an important source of new developments, which are often the result of the improvements they suggest. They also make a decisive contribution to customer satisfaction. They strengthen this satisfaction through their everyday work, since they are often in regular direct contact with customers and are therefore able to deliver tailor-made solutions and precisely focused support services particularly quickly, especially when they are also backed up by digital tools.
It is therefore clear that employees, and particularly those in the metalworking industry, play a vital role in creating value-added and ensuring business success.

A range of tasks At present, the men and women who make up the metalworking industry are confronted with a number of major tasks. These include changing market requirements, personnel shortages and high energy and raw materials prices. As far as the new challenges imposed by the market are concerned, the demand is not only for greater economic efficiency but also, and primarily, for more flexible manufacturing solutions offering increased scalability in order to be able to cater for larger volumes and ever more complex components. It is also crucial to improve the modularity of the solutions in order to simplify system operation in practice. At the same time, there is a need to drive digitalization forwards and, last but not least, the importance of durable, high-quality materials and sustainable production concepts is constantly growing.
The second most important task relates to the lack of skilled workers. This shortfall is making it difficult to fill vacant positions and weighing on productivity. Demographic trends are exacerbating this problem because many experienced

employees are approaching retirement age. Another problem is that younger people, in particular, see technical professions as unattractive.
At the same time, businesses are having to cope with greatly increased raw materials and energy prices. And here again, the onus is placed on the people working in these businesses: They have to design more material-efficient processes in order to overcome increasing cost pressures.

Top priority Otto Bihler Maschinenfabrik is the ideal partner when it comes to getting to grips with the complex tasks facing the metalworking industry. This is because the global market leader for systems technology in the world of forming, welding and assembly is fully focused on people as the most important factor of corporate success: "For us, people have always been right at the heart of things and our customers' and partners' needs and requirements are our top priority," emphasizes Mathias Bihler. True to this philosophy, Otto Bihler Maschinenfabrik delivers not only the required technology but also the necessary expertise. In this way, it is able to supply customized, innovative manufacturing solutions that allow users to fulfill their own specific requirements and assert themselves in the competitive global environment.

Success in modular form As a result, Bihler customers benefit, for example, from new, high-performance systems and technologies that allow them to respond effectively to changing market requirements. The corresponding Bihler systems, such as the new LM 2000-KT, are primarily designed to deliver high manufacturing speeds and with throughput of up to 500 parts per minute, they ensure outstanding productivity. However, since they are equipped with modern Bihler technology, they also provide the efficiency needed to achieve shorter times-to-market. They are supported in this, for example, by the vital benefits provided by Bihler design software in combination with the Bihler LEANTOOL system for tool manufacture. However, Bihler systems also offer the required flexibility, which is becoming ever more important in competitive global markets. For example, customers can use a Bihler GRM-NC to manufacture prototypes and small runs and when the

Otto Bihler Maschinenfabrik's own employees are also the company's most important asset. Whatever their area of activity, they work enthusiastically to provide all customers with exactly the manufacturing solutions they need for their everyday production operations.

required volumes increase or more complex components are demanded, they can move production over to a Bihler LM 2000-KT/-NC or Bihler BIMERIC.

Automation instead of bottlenecks At the same time, enterprises can count on Bihler's very highly-automated manufacturing solutions when faced with the need to overcome labor market shortages. These include, for example, the Bihler BIMERIC modular servo production and assembly system, a Bihler GRM-NC or RM-NC or the Bihler LM 2000-NC and -KT. These systems can run autonomously for up to 48 hours and, starting with the coil material, output end products that are practically ready for shipment. They reduce the effort required on the part of human operatives while simultaneously increasing product quality because human errors are excluded. Of decisive importance is the intelligence of the machines, which practically monitor themselves and make adaptations as required on the basis of countless measured values. This makes it possible to employ the available workforce more efficiently and allows them to focus on more highly-qualified, value-creating activities. One positive side-effect: Automation solutions of this sort represent the current state-of-the-art. Companies that use these technologies are therefore considerably more attractive to the young potential employees of the future.

The simple way to save resources Another vitally important advantage is that modern Bihler manufacturing solutions can also effectively help counterbalance increased raw materials prices. This is because Bihler technology offers simple ways to optimize production in order to make manufacturing methods more material-efficient and less resource-intensive. This is impressively demonstrated by Schürholz Stanztechnik, which has been able to cut the amount of material needed to manufacture housings by approximately 30 percent, or Freudenberg Stanz- und Umform-Technik, which is now able to produce sealing rings using up to 85 percent less material.
Other ways to save both resources and materials are to use the Bihler LEANTOOL system for the development of stamping-and-bending tools or to produce digital twins of systems. This latter solution permits virtual commissioning and minimizes time-consuming troubleshooting iterations without needing any real components or parts.
And to ensure greater sustainability, Bihler not only offers new energy-efficient, resource-saving machines but also undertakes the modernization, general overhauling or extension of existing systems. This means that even older systems can be upgraded to current engineering standards and continue to be used in the future.

For the present and the future The examples presented here show that Otto Bihler Maschinenfabrik offers a wealth of innovative, high-performance technologies, products and services that allow all its customers and partners to deal effectively with the tasks currently facing the market. It is then up to them to make the best possible use of them. Naturally, investments are required for this. However, these are worthwhile because they allow users to make their production operations vastly more efficient and economical, in particular in the light of the current requirements. In this way, they ensure that they are optimally equipped for a future in which these requirements will presumably become even more exacting. And it is also important to remember that Bihler provides all its customers with comprehensive support during the introduction of new technologies and solutions, from the initial inquiry right through to live production. This means that customers benefit from Bihler's proven support service during every phase. All in all, Otto Bihler Maschinenfabrik therefore supplies exactly the solutions that people working in today's businesses need and that will allow them to maintain their performance and competitiveness in the future. ●

“WE NEED TO PULL TOGETHER IN EUROPE”

The Allgäu is a high-tech region. That is something that the head of the Supervisory Board of HAWE Hydraulik SE, Karl Haeusgen, and Mathias Bihler both agree on in their discussion. The venue for this exchange of opinions is symbolic. The new HAWE plant in Kaufbeuren impresses visitors with its streamlined architectural elegance and functionality and forms the structural framework within which state-of-the-art robot and automation technology show off their strengths. The halls are light, the noise level is very low and the atmosphere is pleasant. Welcome to the mechanical engineering of the future!

The HAWE plant in Kaufbeuren: The architectural concept follows the idea of a campus-style “green factory” integrated in the countryside at the edge of the Allgäu.

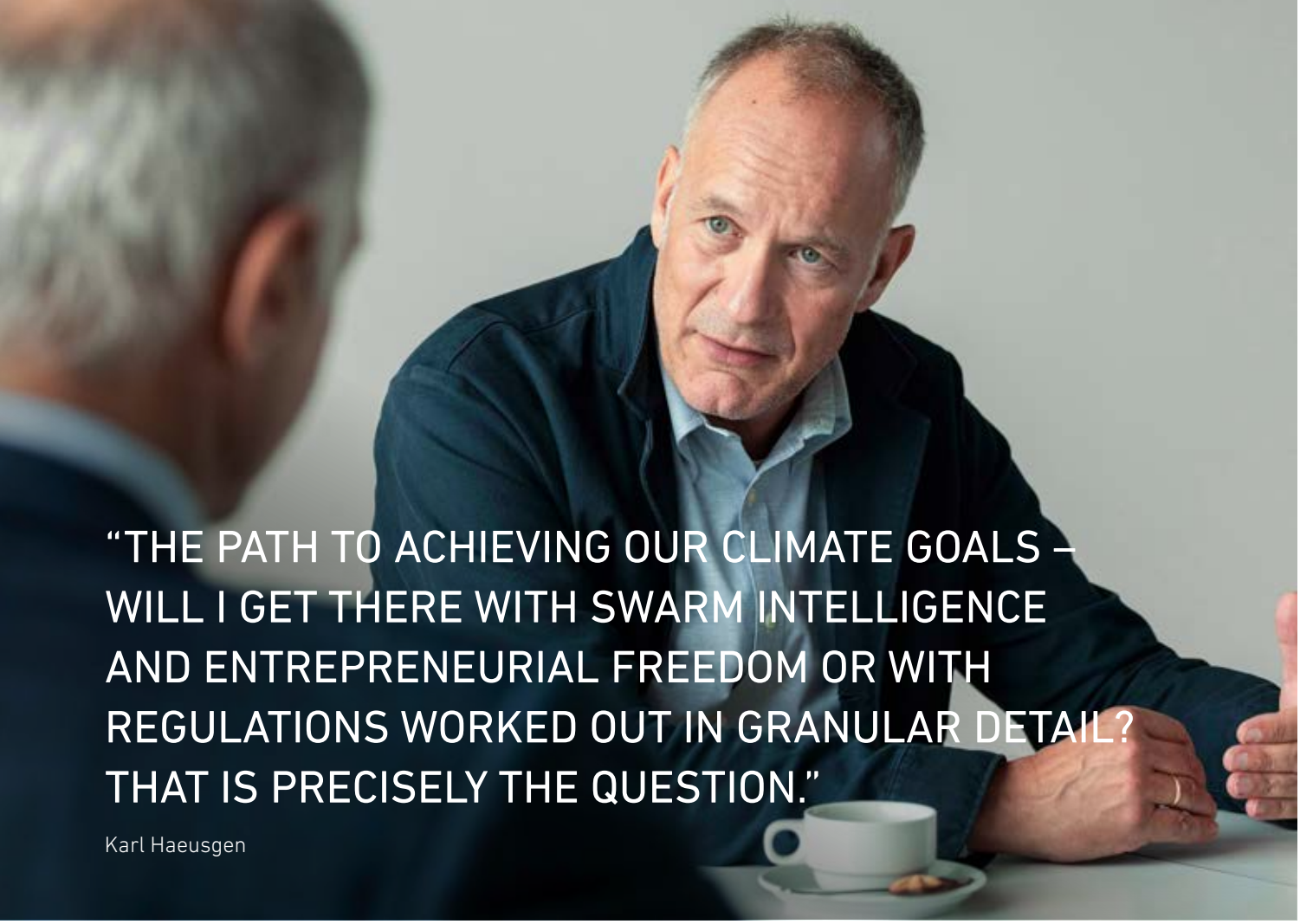
The Allgäu Technology Region: Mathias Bihler and Karl Haeusgen share their thoughts on the roof terrace of the HAWE plant in Kaufbeuren.

The HAWE plant in Kaufbeuren. After a tour of the site, two dedicated entrepreneurs, in the form of Mathias Bihler and Karl Haeusgen, find time to share their thoughts. It will be very exciting to find out what the President of the Verband des Deutschen Maschinen - und Anlagenbaus (German Engineering Federation - VDMA) and majority shareholder in the long-established company HAWE, and Mathias Bihler, responsible for the management of a family-owned company, have to say to one another. It is easy to see how both men are driven by a passion to work for the future of Germany as an industrial center both in Europe and throughout the world.

Mathias Bihler This glimpse of your production facilities has been most impressive: the systems with their high level of vertical integration, the innovative automation solutions and the use of robot technology. I was particularly struck by the depth of value-added contributed in-house that I saw during our tour.

Karl Haeusgen We naturally operate a very capital-intensive business model. That means that if you, like us, have blocks of elements that represent high fixed costs then these must constantly be used at full capacity. We are convinced that we are on the right path because we have our value chain under control and are able to achieve very stable qualities and quantities. We will remain faithful to this concept of high in-house pre-production inputs. This is something that investors and bankers do not always understand, but it is consistent with our clearly-defined strategy.

Mathias Bihler I can understand that lenders might not initially see



“THE PATH TO ACHIEVING OUR CLIMATE GOALS – WILL I GET THERE WITH SWARM INTELLIGENCE AND ENTREPRENEURIAL FREEDOM OR WITH REGULATIONS WORKED OUT IN GRANULAR DETAIL? THAT IS PRECISELY THE QUESTION.”

Karl Haeusgen

Karl Haeusgen, 57, is Chairman of the Supervisory Board and majority shareholder of the family-owned company HAWE Hydraulik SE. He is also President of the German Engineering Federation (Verband Deutscher Maschinen- und Anlagenbau e.V., VDMA). After studying business administration at the University of St. Gallen, he worked for Barmag Far East Ltd., a subsidiary of the German textile machine manufacturer Barmag, as well as for MAHO AG. From 1996 to 2019, Karl Haeusgen was a member of the Managing Board and Board Spokesman for HAWE Hydraulik SE, Munich. Born in Munich, he acts in a voluntary capacity as Chairman of the Foundation “Lyrik Kabinett München” and a member of the Supervisory Board of “Kinderschutz München e.V.”.

the value of this approach. During a downturn, it is always a burden but you nevertheless have to see things in the round. This is something we have in common. We also have a high level of inhouse pre-production at approximately 75 percent. And we are doing as much as we can to promote automation in our own activities. The clear objective is to be efficient in the way we manufacture our products in order to strengthen the earnings situation and, in turn, reinvest in new developments In the fields of stamping, bending and assembly, we are undoubtedly leaders in many markets when it comes to the level of automation. We aim to combine flexibility, standardization, scalability and economic efficiency with the digital world: We are very well positioned compared to other market players. But we want to go further. During our visit, I was able to see a large number of interesting initiatives, in particular with regard to digitalization. For example, we are working on the issue of the “digital twin”. The great benefit of this is that, for example, if optimizations are made to a system’s process sequences in the virtual world, then production machines do not have to be shut down for the optimization activities and the improvements can instead be undertaken by means of simulations at the digital twin. If the process is successful then we transfer the optimizations to the real machine. This enables us to minimize production losses. And that is a decisive advantage for our customers. Machines are capital-intensive products. They have to produce 24/7! However, we not only invest in equipment but also in the people who are vital for a company’s efficiency, productivity and success.

Karl Haeusgen That’s just the way we see it. You have your own comprehensive in-house training department that covers many different areas. We have a similar concept. We have a trainee rate of ten percent. The labor market in the Allgäu is very competitive. Within a radius

of 20 minutes by car, we have Agco Fendt, Grob and other large companies that are all proactively recruiting. We have to make ourselves so attractive as an employer that people want to come to us – whether as an apprentice or a young professional – and then want to stay. We started by conducting a survey in which we asked exactly what it is that is important to our employees at their workplaces. The results revealed the issues of light, noise and climate – far ahead of all other aspects. That is why we have invested so much in these issues, as you are able to see in the building. And this isn't just a subjective impression. Studies have clearly shown that, for example, reducing background noise significantly increases productivity.

Mathias Bihler For us, the workplace and the company culture also play a vitally important role. In the face of the skilled labor shortage, that is one of the levers we can pull ...

Karl Haeusgen That is one thing we can do when we look at the issue of the shortage of skilled labor in Germany. I am one of those people who is quite forthright about the issues of working hours and the overall working lifetime. In the long term, we will not be able to manage with a 35-hour week and retirement at 63. We need a longer working life, at least in those sectors where the work is not physically demanding. We must have the 40-hour week as standard, as the reference point, just as it is in other industries. Finance Minister Christian Lindner is the first to have dared to raise this issue.

Mathias Bihler That is the reality. There are many areas in which Germany drives technology forwards. However, that is underpinned by many hours of work on the part of highly-qualified individuals. And if these hours fall away then this technological leadership will also suffer. Demographic change means that not enough new blood is coming through to take up the slack.

Karl Haeusgen And if you want to be fit for the future then it is also important to actively address the crucial topic of sustainability.
For decades, the way in which climate change was managed was truly inadequate. For me, one of the great successes of "Fridays for Future" is to have moved this topic into the public eye. That was a true wake-up call. Then, however, the pendulum swung. In particular, in the form of detailed political regulation.
That's the problem. It's not that we're introducing CO_2 targets; it's the way that we're doing it. One example is the EU regulation on sustainable investment. It defines what is considered to be green technology and what isn't. That is then what gains the favor of the banks and insurance companies and receives finance. The catalog has more than 1000 pages. How is that supposed to work? How can I think of drawing up a list of green technologies that then forms the basis for a law if just four weeks later new technologies arrive that the European Parliament has never even heard about? The aims are right. But the way there – Will I get there with swarm intelligence and entrepreneurial freedom or with regulations worked out in granular detail? That is precisely the question.

HAWE HYDRAULIK

HAWE Hydraulik SE
As a technology leader, HAWE Hydraulik supplies mechatronic controllers and electro-hydraulic drives. The company employs some 2470 people at its headquarters in Aschheim near Munich, at eleven other sites in Germany and in 23 subsidiaries in Europe, North America and Asia. Its philosophy includes a high level of vertical integration, efficient processes and quality consciousness. HAWE is an owner-managed company. The Kaufbeuren site was opened in 2014 and an office complex (design and development) was added in 2021. The architecture is the work of the renowned German-American firm of architects Barkow Leibinger (Berlin/New York). HAWE employs approximately 700 people in its production facility at its site on the B 12 trunk road. The company places special emphasis on achieving a high level of vertical integration.

Mathias Bihler We need more courage and pragmatism and not political overregulation. What we're also lacking is young people capable of getting to grips with technology. But the universities and technical colleges are telling us that there's been a massive drop in applicants for technical courses. Without a new generation of technology-loving engineers, the objectives of sustainable climate change will be beyond our reach.

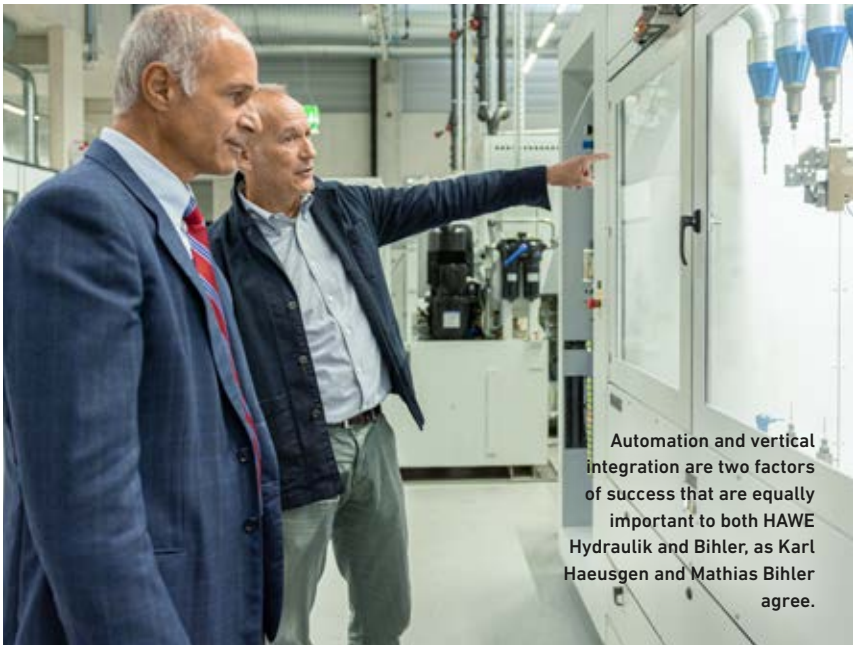
Karl Haeusgen As a young person, the best thing you can do to combat climate change is to become an engineer. Then you can help develop the technological solutions. If we look at the huge field covered by mechanical engineering, it doesn't matter what energy choices you make, what mobility choices, they will always involve components and systems from the mechanical engineering industry. For example, we have reduced the CO_2 footprint of one of our hydraulic controllers by 70 percent. Let me give you an example. In China, Apple is building a new production facility for iPhones and has specified that this must release 30 percent less CO_2 than in the past. The machine manufacturer, in this case a Japanese company, then turns to us. That's the right way, the pressure comes from the market. Apple is put under pressure by its consumers and passes this pressure onto the machine supplier and the result is a hydraulic component whose CO_2 footprint has been reduced by 70 percent. That is the perfect mechanism. That is something that State regulation cannot hit upon by itself. You can define CO_2 prices and CO_2 quotas and that helps move things along. Of course it's clear that you can't do completely without regulation, but it's important to keep it at the right level. What we need is clear goals and perfect framework conditions, that is to say the right infrastructure. After that, it is vital to leave it up to the actors in the market how they achieve these goals. The way we contribute to achieving these climate goals is also important when it comes to attracting skilled workers. When we recruit young people nowadays, they look very closely at the issue of sustainability. For example, do we have solar panels on the roof, do we publish a sustainability report, do we really act sustainably?

Mathias Bihler This new level of awareness is something that we have also noticed. At our factory in Füssen, we also have a solar power installation and a cogeneration plant and are therefore able to cover a large part of our energy needs ourselves. Our buildings are also progressively becoming more energy efficient. When it comes to using materials efficiently, we make sure that we are responsible in our resource consumption. We understand that if we develop products that stand out from the others available on the market through their innovative qualities, that are customer-oriented and can be produced using efficient process technologies, then there's no need to relocate abroad because of cost considerations. But the various constraints at the level of bureaucracy or energy issues are burdens that make businesses wonder whether they are still in the right place? However, proactive individual initiatives are being launched. We are seeing a desire to return to "local to local" among some of our customers. Some businesses are leaving Asia and focusing on developing their manufacturing platforms in Europe again in order to make goods transport shorter and more efficient and consequently change their CO_2 footprint for the better.

Karl Haeusgen When I put on my VDMA hat, I can only agree. We have 3,600 member companies with an average of 200 employees each. Due in part to the resources at their disposal these companies are incredibly faithful to their local roots. Something which often goes completely unmentioned in this debate is the technology cluster. If you set off in a truck from here in Kaufbeuren then you'll find every technology you need in less than a four-hour drive. Whether that is sensor technology, optoelectronics, hydraulics or mechanical engineering. Every technology is available to you. This technology cluster made up by Southern Germany, Vorarlberg, Northern Italy and Switzerland is unparalleled.

Mathias Bihler How do you see the situation in Asia?

Karl Haeusgen China accounts for 23 percent of HAWE's turnover;



Automation and vertical integration are two factors of success that are equally important to both HAWE Hydraulik and Bihler, as Karl Haeusgen and Mathias Bihler agree.

what's more with quite high margins. The corresponding value for the German mechanical engineering sector as a whole is ten percent. The largest export market is the USA with approximately 13 percent. So China is the second-largest market. It's clear that we have to think about things very carefully. The greatest risk is the nationalizing industrial policy of the Chinese. They look very closely at what is strategically important for China. The companies in these sectors are then protected by the State against any WTO rules. When these businesses have developed to the point that they can compete in terms of both cost and quality, the market share of the international market players is reduced. As a result, Chinese companies have a cost advantage when it comes to entering international markets due to the volumes in their domestic market.

Mathias Bihler That's something I can definitely confirm. China is building up know-how that the western world often unwittingly transfers to it by doing business with China and failing to think about the long term. If we do conduct projects with China then it's not at the technical level as in the case of customers in Europe. However, you can't shut yourself away from the Chinese market and so we act in a measured, sensitive way because we don't want our customers in the western world to come under pressure.

Karl Haeusgen Here again, we make sure that we differentiate ourselves at the technological level. And that's not easy.

Mathias Bihler Globalization is important for us. However, many people haven't yet understood what Europe is supposed to achieve here. The single currency is important but it is only a means to an end. We need to be an economic counterweight to America and Asia. However, that will only be possible if Europe is united, acts together and doesn't become fragmented.

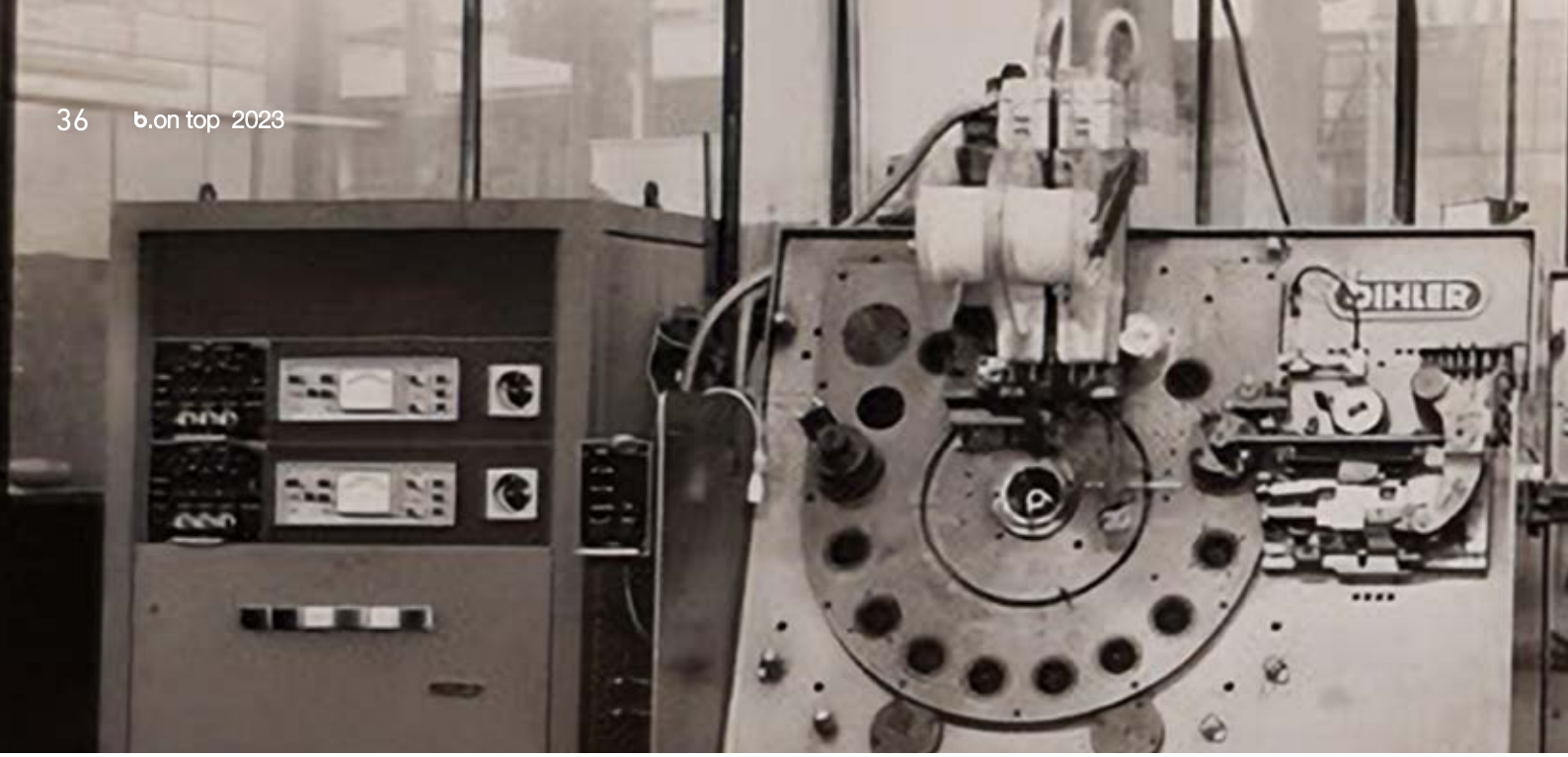
Karl Haeusgen What annoys me is that the individual governments are once again able to hand out larger subsidies and that is what they are doing instead of acting at the European level. There is a type of ingrained conservatism here.

Mathias Bihler The European idea has been lost. The task of politics is to unite Europe again because only a united Europe will be able to re-establish the economic balance with America and Asia ...

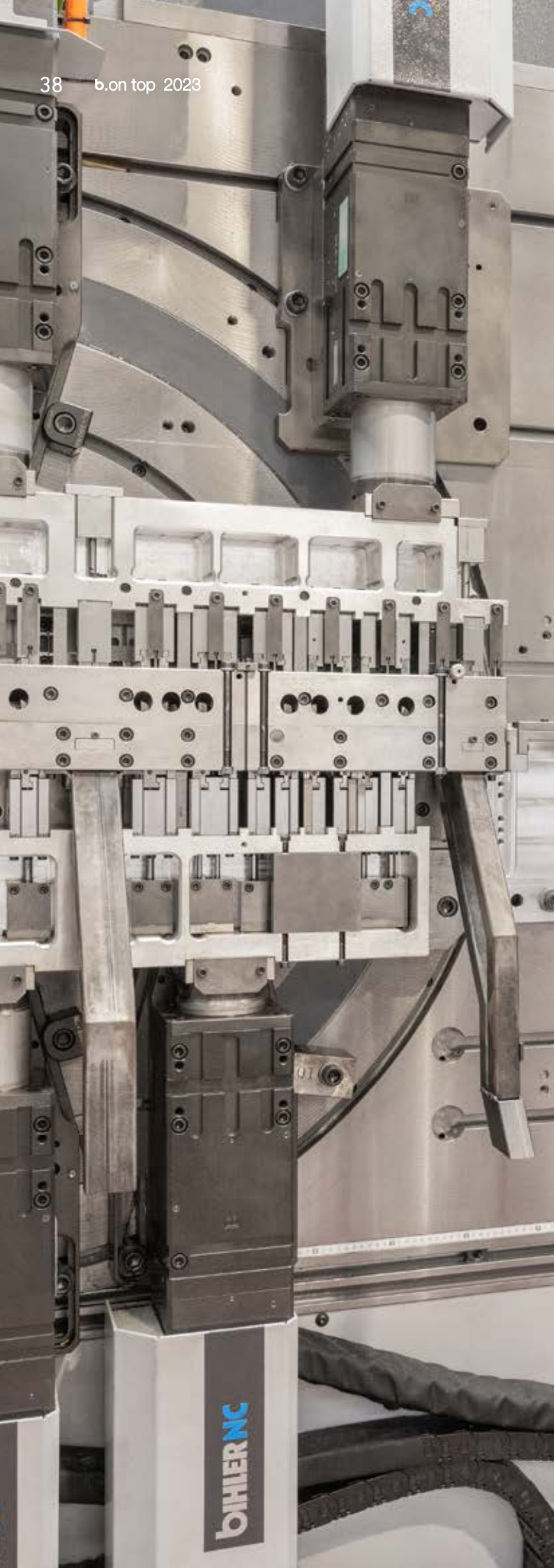
Karl Haeusgen ... and I would add that it's also the task of industry. Because many decision-makers in industry do not think at the European level. But the only way to move forward is together! ●

VDMA

The Verband Deutscher Maschinen und Anlagenbau (German Engineering Federation, VDMA) represents the economic, technical and scientific interests of its 3,600 members in Germany and throughout Europe. The companies in the Federation have a joint turnover of 244 billion euros and, with a combined workforce of 1.2 million, are Germany's largest industrial employer.


DIHLER

HOW A SHARED HISTORY CONTINUES TO THRIVE.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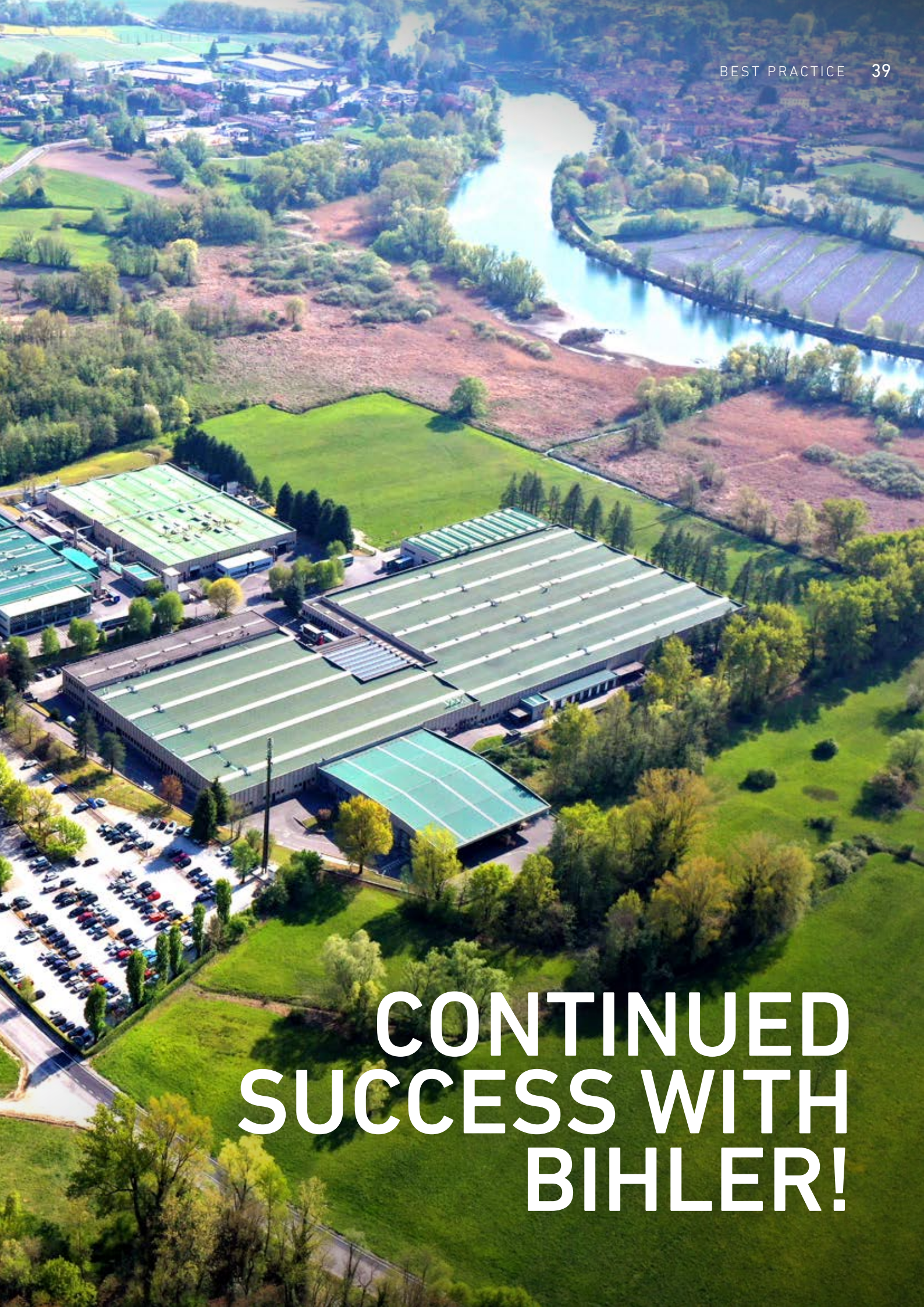


CONTINUED SUCCESS WITH BIHLER!

- Available manufacturing time increased by up to 300 percent
- Setup times reduced by up to 90 percent

The M.S.Ambrogio Group has always relied on innovative Bihler technology to ensure its market success. This applies just as much to the first Bihler RM 25 from the year 1959 as it does to the 16 new servo-controlled Bihler type GRM-NC and RM-NC stamping and bending machines. These have not only helped the North Italian family-owned company achieve enormous improvements in manufacturing efficiency but will also permit the production of more complex assemblies in the future. In this way, they therefore represent a further step in a decades-long, shared success story.

With an annual production output of more than ten billion parts, some 1,500 employees and a total of nine sites in Europe, North and South America, the M.S.Ambrogio Group is one of the world's leading manufacturers of assemblies, electrical and electronic components, stamped-and-bended parts, springs and injection-molded components. The Group's head office is located in Cisano Bergamasco, north-west of Bergamo, where M.S.Ambrogio S.p.A manufactures components for the automotive, electrical and electronics, household appliances and furniture industries on approx-imately 280 production lines. And it is in a small house in the nearby town of Lecco that this success story was born when, in 1949, Aurelio Sangalli, his father Mario and his brother-in-law Luigi Meda started to produce springs and small metal parts. Over the years and decades that followed, the company grew to its present size. Since 1990, Mario Sangalli, the son of Aurelio Sangalli, has been at the helm of the M.S.Ambrogio Group as owner and CEO.

Employees are the most valuable asset Two aspects have always been and continue to be fundamental for the company's direction and character: "Our success is based on an outstanding level of enthusiasm and exper-tise. These attributes were decisive all those years ago and continue to be so today," explains Mario Sangalli. The work-force plays a vital role in all this: "Our employees are our most valuable asset. With their expertise and hard work, they have made the company what it is, and it is only hand-in-hand with them that we can continue to be successful in the future." It is this huge value that M.S.Ambrogio attaches to its workforce that explains its immense commitment in the fields of employee support, personnel development and staff training. This is why M.S.Ambrogio founded its in-house Academy in 2015. This offers mechatronic courses for young graduates through close cooperations with renowned institutes such as the Polytechnic University of Milan.

Mario Sangalli, current owner and CEO of the M.S.Ambrogio Group, next to the bust of his father, Aurelio Sangalli, who founded the company in 1949.

Head office of the globally active M.S.Ambrogio Group in Cisano Bergamasco

280 PRODUCTION LINES
700 EMPLOYEES
4.1 BILLION parts produced per year

45 % AUTOMOTIVE INDUSTRY
40 % ELECTRICAL & ELECTRONIC
9 % DOMESTIC APPLIANCES & FURNITURE
6 % OTHER

Always at the forefront of technology In addition to the enthusiasm and expertise of its employees, there is another crucial factor in M.S.Ambrogio's success, and that is having the right technology. "We place great value on always being at the forefront of technology and working with the most advanced systems and machines available on the market," stresses Mario Sangalli. "And when it comes to the field of stamping-and-bending technology, there is only name we look at and that is Otto Bihler Maschinenfabrik. There is no other company in the world that can match Bihler." This view was also held by the founding fathers of M.S.Ambrogio. Back in the 1950s, they discovered Bihler's – for its times revolutionary – stamping-and-bending technology and were immediately won over by it. With the help of Carlo Alberto Carutti, the father of the current Bihler representative Efisio Carutti, they acquired a Bihler RM 25 back in 1959. This signaled the start of a collaboration that has lasted over 50 years and is now into its third generation.

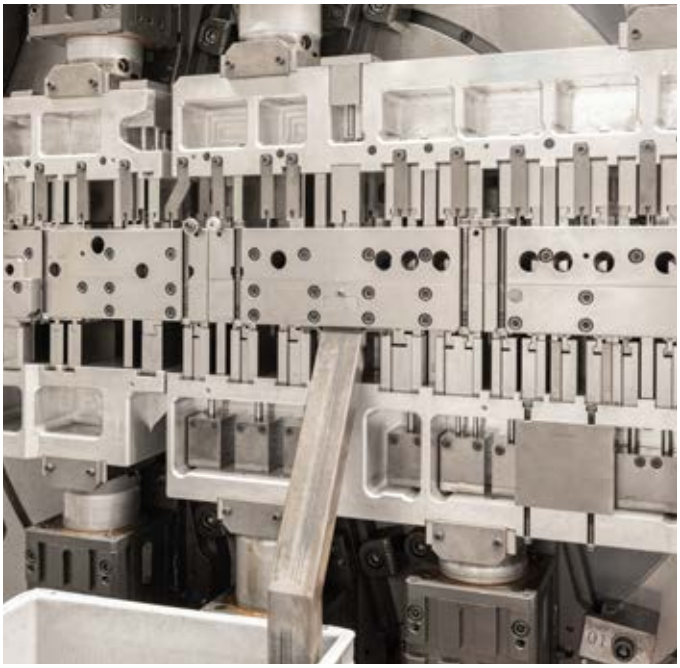
Buy first ... then look for projects "We continue to purchase Bihler machines and our most recent acquisition comprised 16 Bihler GRM-NC and RM-NC systems," recounts Mario Sangalli. What makes this acquisition so special is that – as so often with M.S.Ambrogio – the systems were purchased without any concrete products being scheduled for them. "I was simply won over by Bihler's NC technology, so we first purchased the machines and then looked around the market to identify products that could be optimally manufactured on them. And we didn't take very long at all to find them," explains Mario Sangalli. "Looking back, we can say that we have made a huge stride forward thanks to Bihler's NC technology," adds Marco Ruggeri, Corporate General Manager.

Well positioned for the future: CEO Mario Sangalli (5th from right) with his family and Bihler representative Efisio Carutti (3rd from right) with his daughter Eleonora (right).

Improved efficiency, absolute reproducibility Currently, connectors for charging electric vehicles are being manufactured on one Bihler GRM-NC. The linear tool used for this was designed in-house by M.S.Ambrogio itself. By contrast, a Bihler RM-NC is currently being used to produce fastening clips for vehicle side panels, again using a radial tool designed in-house. Mario Sangalli: "With our Bihler NC systems, we have once again been able to significantly improve our manufacturing efficiency while still ensuring outstanding parts quality. One vital aspect was that we were able to transfer our existing tools, for example from our Bihler GRM 40 and 80 systems, to our new Bihler NC machines without the need for any expensive or time-consuming modifications. Everything can be set up in a matter of seconds at the touch of a button and production can get underway immediately. That would have been inconceivable with our mechanical Bihler systems." More specifically, setup times have been reduced by 50 to 90 percent on average and manufacturing speeds have been increased by up to 300 percent. "Another very important plus lies in the fact that the systems are exceptionally stable and ensure very high reproducibility. For example, if we set up the same tool again after a six-month interval then we will have exactly the same component quality. That is an enormous advantage," explains Mario Sangalli.

At the new Bihler systems, machine fitter Paolo Milani is able to prepare for manufacturing at the touch of a button in just a few seconds and production can start immediately.

A new direction With Bihler and, in particular, the new Bihler servo-controlled stamping-and-bending machines, M.S.Ambrogio is also well prepared for the future. "Because there is very fierce competition in the field of simple parts, we will concentrate on more complex components and assemblies in the future, for example on the assembly of metal-plastic composite parts. We can manu-



Connectors for charging electric vehicles are manufactured on a new Bihler GRM-NC. The linear tool used for this was designed in-house by M.S.Ambrogio itself.

facture these at high speed and in optimum quality on our new systems. This is extremely capital-intensive but is still worthwhile because we have very few competitors in this market sector," is how Mario Sangalli assesses the outlook. "We are also looking forward to future Bihler innovations, in particular in the fields of remote services, monitoring and AI-based services. We can then use these throughout the entire group," adds Marco Ruggeri.

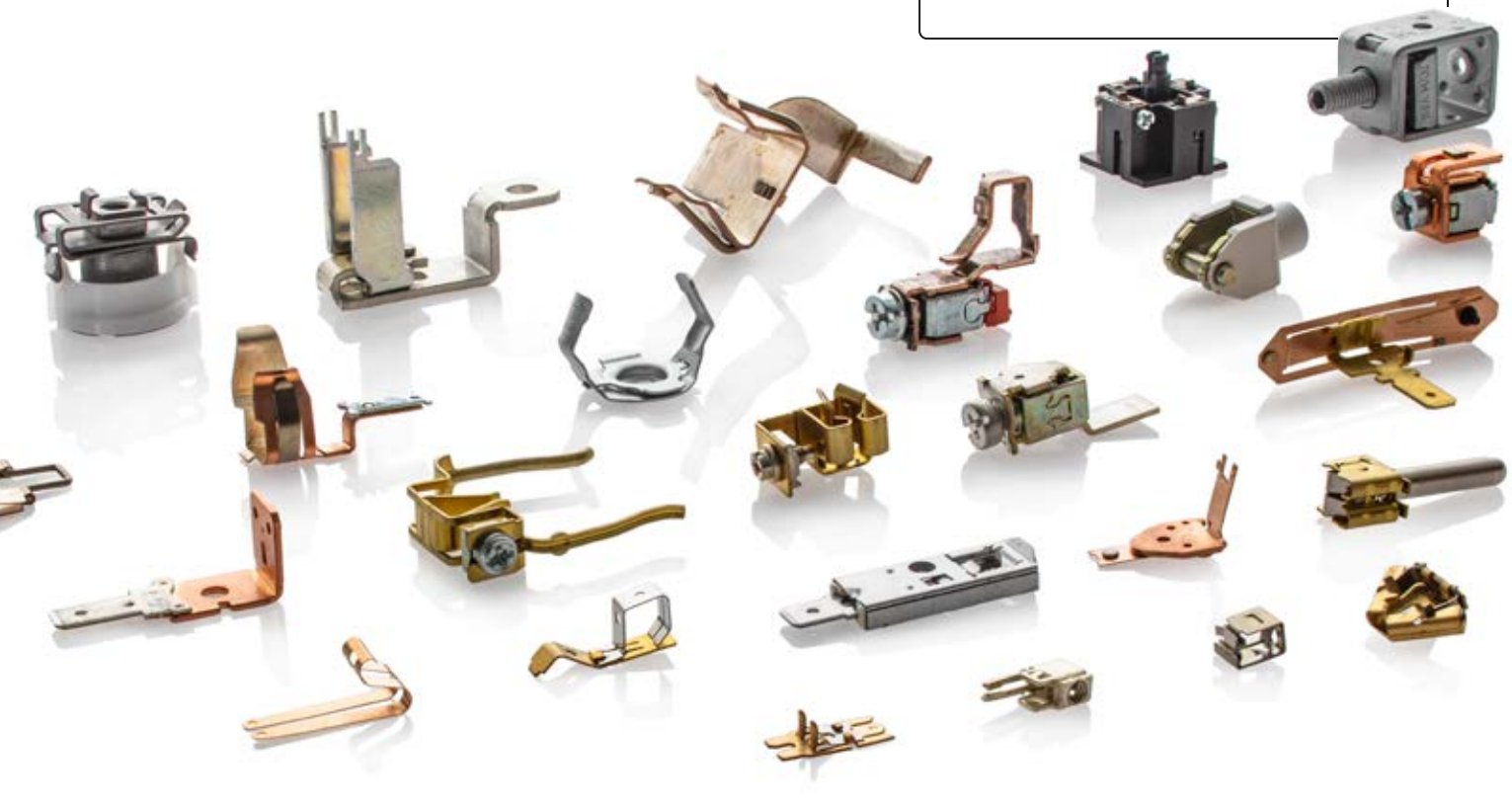
Optimistic about the future "With Bihler at our side, we can be optimistic about our future," is how Mario Sangalli sums things up. "We are now the third generation in the company to have worked with Bihler. I have no doubt whatsoever that we will also be able to continue our shared success story into the coming decades." ●

M.S.AMBROGIO

M.S.Ambrogio

The production site in Cisano Bergamasco is also the current headquarters of the M.S.Ambrogio Group. This Group comprises nine companies that specialize in the manufacture of metal and plastic components. At present, the Group has a workforce of some 1,500 employees, possesses approximately 1,000 manufacturing lines and produces about 10,000 different articles every year, including assemblies, electrical contacts, injection-molded parts, stamped and stamped and bended parts, bended wire parts, magnetic disks and springs. In 2022, M.S.Ambrogio achieved sales of 378 million euros.

www.msambrogio.it



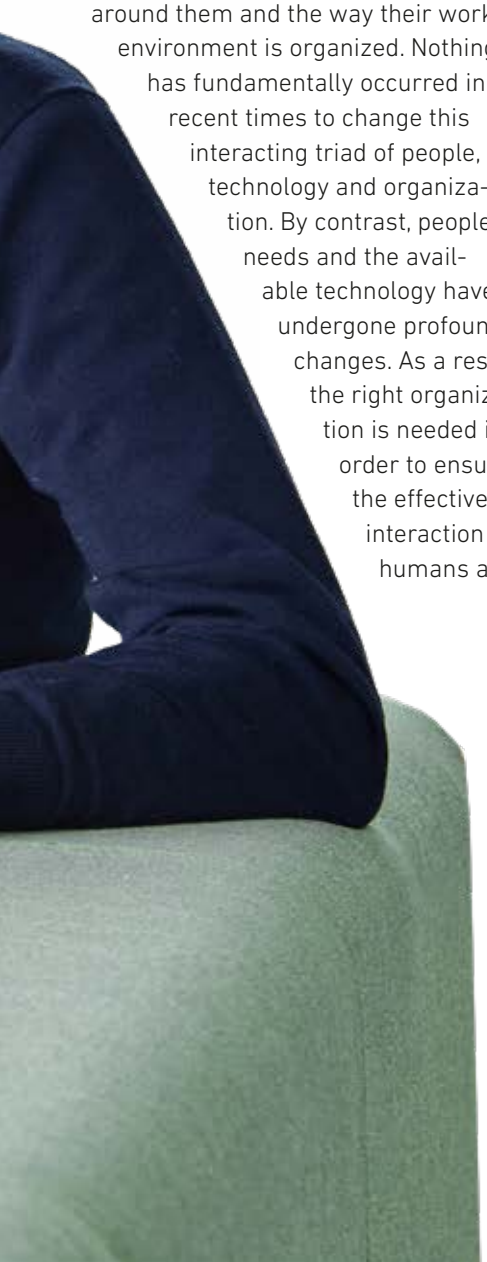
THE HUMAN FACTOR DRIVES US ON

Everything was better in the old days. Or was it just different? What role do we play in today's working world Dr.-Ing. Stefan Rief from the Fraunhofer Institute for Industrial Engineering (IAO) explains how human needs can dovetail most effectively with technology and organization.

Dr.-Ing. Stefan Rief
has been head of the Organizational Development and Work Design research unit at the Stuttgart-based Fraunhofer Institute for Industrial Engineering (IAO) since 2018. The research unit's key topics include flexible and self-organized forms of work and organizational models, virtual cooperation, the digital transformation and cognitive working and living environments.

What factors are relevant for work and organization in the modern business world and what significance do people have?

People continue to be at the heart of everything. They drive every undertaking forwards with their curiosity, creativity and ability to shape developments and it is they who come up with innovations and bring them to fruition. It is therefore important to allow them to work under optimum conditions and provide them with the best possible support in terms of productivity, motivation and well-being. They are naturally influenced by the technology around them and the way their working environment is organized. Nothing has fundamentally occurred in recent times to change this interacting triad of people, technology and organization. By contrast, people's needs and the available technology have undergone profound changes. As a result, the right organization is needed in order to ensure the effective interaction of humans and technology – in particular because technologies such as AI are strongly influencing the way people interact. It is important that people remain curious and creative.



Ideally, how should these three dimensions – people, technology and organization – be structured in a company?

For everyone, it is vital to feel secure and supported in your job and to work in an environment of trust and cooperation. However, people's needs have become much more individual, and this makes collaboration more difficult. For example, the pandemic greatly increased the amount of work done remotely in the home office and the effort involved in balancing the time demands of individual members of teams or organizations has grown accordingly. Managers are not able to organize all this. Instead, this task should be handed back to the team, which can then develop the model that suits it best. Managers must then check whether this model works and regularly reorient it as required. This is because we are being permanently confronted by new challenges such as supply chain problems or compliance with new environmental standards. The model must be equally regularly checked to make sure that it works internally for the team members. In this context, it will be exciting to use the new collaboration systems. For example, if you take a look at the number of videoconferences held within a team, potential communication shortfalls between certain members quickly become clear. This is real data that objectively reflects such situations as they arise. It is therefore important to accept this type of new technology, understand it and use it profitably to keep people responsive, motivated and curious in this new, permanently changing working world.

How do you assess the future development of the working world?

The working world has changed considerably due to the pandemic. We all feel that we have understood the new way of working. However, I don't believe that. After all, we have been doing this for only one-and-a-half years after first spending decades doing things very differently. We must therefore watch very closely to see what effect this new form of working has on us. Despite this, we must also be prepared to adapt to it. It is also very important for a company to meet the needs of its own workforce wherever this is possible. However, I also think that companies need a strong and coherent culture and identity. Desirable forms of behavior have to be actively embraced and exemplified and, at the same time, it is necessary to create an environment that is conducive to this. ●

ALWAYS SEARCHING FOR THE BEST WAY FORWARDS

He has known victory, he has known defeat. And he knows how to achieve his aim Marco Büchel, retired world-class alpine ski racer from Liechtenstein, tells us what it takes to get to the very top in elite sport and what lessons this has for the working world.

How did you get to the pinnacle of the international ski-racing scene and what were the most important factors and personal attributes?

I owe my success in this sport to my talent, but first and foremost to my tenacity, discipline and commitment: I devoted myself body and soul to ski racing and it was my stated aim to make myself the best in the world. But it was a tough journey that took a long time to complete. Things often picked up a little, only then to go downhill again. It is in situations like those that you see whether you have the necessary willpower and how much you are prepared to give to achieve your goal – or whether it's best to simply give up. I was always very clear about my goal and I pursued it tenaciously.

What strategy did you have to cope as well as you possibly could with defeats as well as with the risks involved in ski racing?

I like to ponder on the fact that I took part in 300 races at the very highest level but only won four of them. That means that I lost 296 times! However, these defeats always taught me much more than my victories. I learned to draw the right conclusions from them and, ultimately, that is also the way to progress. At the same time, of course, I had to cope with the high risk of injury in my chosen sport – although the "danger" element also always fascinated me. To truly push oneself to the limit is an explosive emotional experience and that is exactly what I wanted.

Marco Büchel
Marco Büchel is a Liechtensteiner who took part in some 300 World Cup races between 1991 and 2010. He also participated in six Winter Olympics and ten World Championships, resulting in 90 Top-10 rankings, 18 podium finishes, four World Cup victories and Silver in the Giant Slalom at the World Championships in Vail in 1999. Since retiring, the ski racer has been active as a speaker and communicator.

Today, how much do you benefit personally from your experiences of ski racing?

My career taught me many things of fundamental importance, for example regarding fairness and respect. Most of all, however, I discovered how important it is to fight passionately for your goals. I have to achieve it for myself, I have to keep moving, look to the future and stay inquisitive and curious. You have to act if you ever want to achieve anything. And when you then achieve your goal, that has enormous value. In my opinion, this is true for almost every aspect of life.

As a speaker invited by businesses, you regularly talk about your experiences in elite sport. What are your most important messages to people in today's working world?

At events like that, I talk about what I have experienced in my career and try to help my audience appropriate this knowledge and these experiences. I don't tell the people there that they simply have to work harder if they want to achieve their goals. Instead, what is important – and that was always also true for me as an athlete – is to work together in a team. This is what I describe and I usually also talk about how I approached risk management. I don't consciously give my audience any tips about motivation but talk, for example, about how I motivated myself during the really difficult times, for example when my great idol told me that I'd be better off renting out deckchairs because I was never going to make it to the top. What I want is for my listeners to reflect on that for themselves, transfer it to their own situation and draw their own personal conclusions. I think it often works – and if it doesn't, then I hope that at least I've been entertaining! ●

Seen here at the Olympic Games in Canada, Marco Büchel spent years as one of the world's leading ski racers.

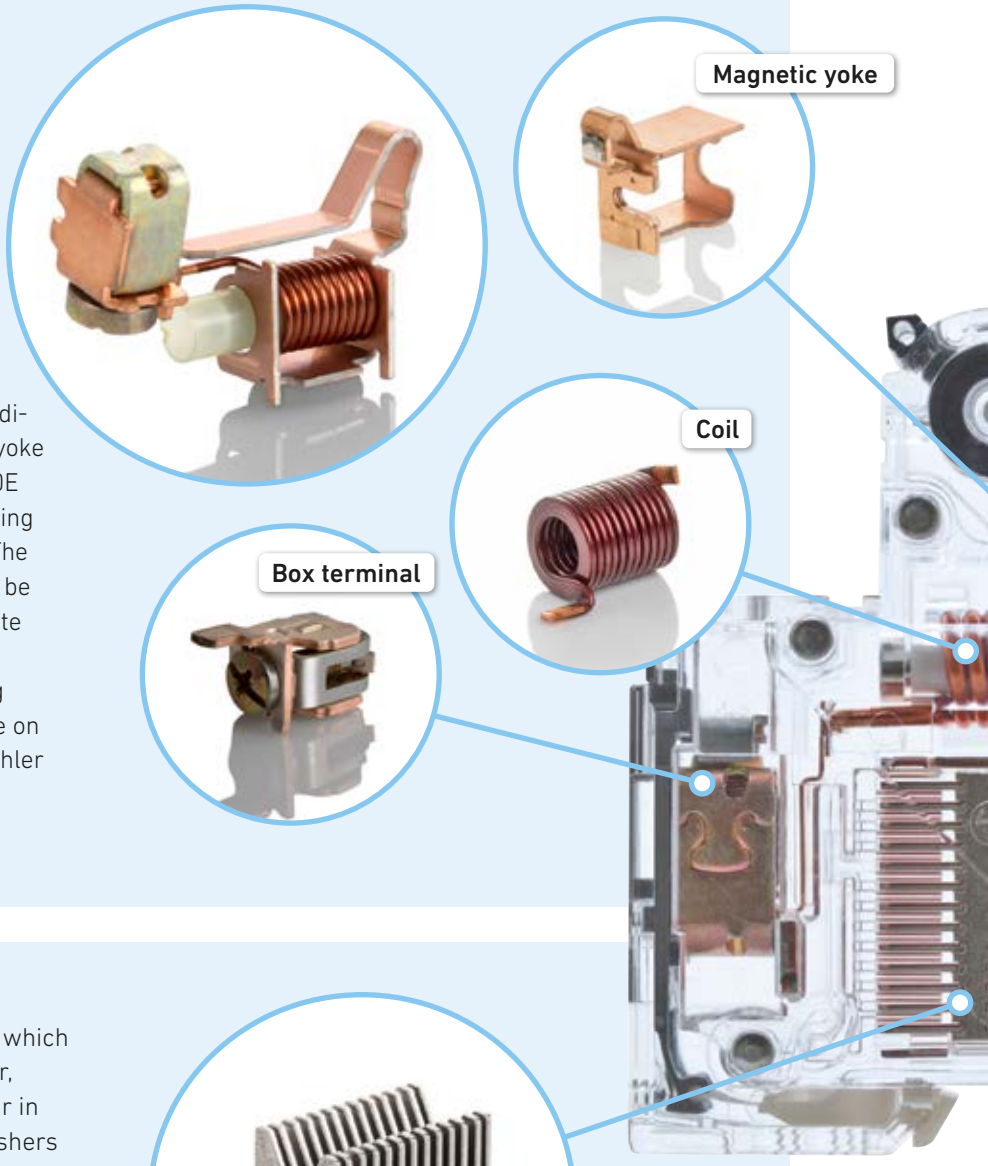
DEVICE TRIPPED. LIVES SAVED.

By interrupting the current in the event of a short-circuit or overload, they prevent potential fire hazards: Circuit breakers. These safety devices, which were first manufactured in 1924 by Hugo Stotz in Mannheim, are now established components in all electrical installations, where they ensure the safety of all the circuits present, irrespective of the different current intensities and cut-off characteristics. In an emergency, the current is cut off by means of a bimetal strip which bends as it is heated by the current passing through it and trips the cut-off mechanism or, alternatively, by an inductive electromagnetic effect that is triggered in response to a short-circuit. At the same time, circuit breakers can also be activated manually using the actuator lever, for example when performing maintenance work or for the temporary disconnection of an electric circuit. All in all,circuit breakers are highly-complex components that have to operate absolutely securely and reliably. This precision and reproducibility can be guaranteed using Bihler technology because the majority of the required components and assemblies can be manufactured flawlessly and in top quality on Bihler's systems.

SAFETY THROUGH BIHLER TECHNOLOGY

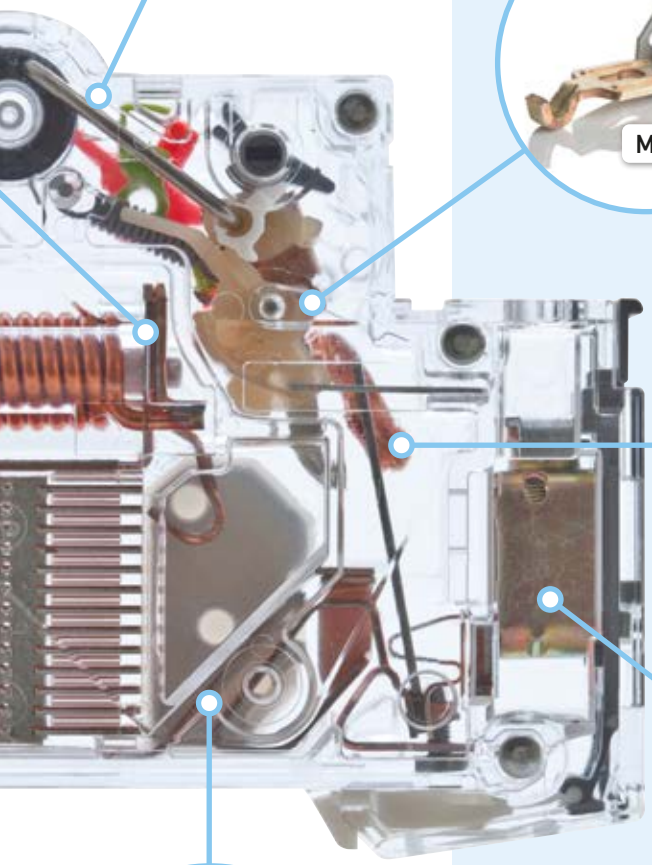
Circuit breakers consist of a plastic housing which contains the various components and assemblies. The most important components include the magnetic assembly, the trip mechanism, the thermal assembly, the arc extinguisher and the terminal. Most of the required components can be manufactured either as individual parts or as fully-assembled modules in irreproachable, safety-oriented quality using Bihler technology. The various techniques and processes used also excel due to the particularly high manufacturing efficiency they permit.

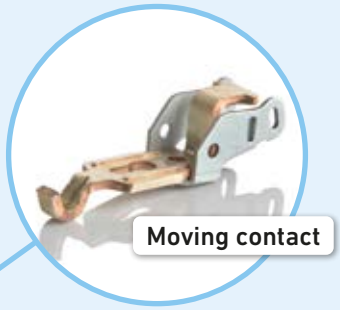
Magnetic assembly
The magnetic assembly used in circuit breakers ensures that the current is interrupted in the event of a short-circuit. It consists of a coil, magnetic core, armature, magnetic yoke, fixed contact and terminal (box terminal). This unit can be manufactured as a complete assembly on a Bihler BZ 2-12 processing center at a speed of up to 125 finished parts per minute. However, Bihler technology also makes it possible to manufacture all the components as individual parts. For example, the magnetic yoke can be manufactured on a Bihler GRM 80E or a Bihler GRM 80P stamping-and-bending machine at up to 160 parts per minute. The stamped, bended box terminals can also be produced extremely efficiently as separate items – at up to 240 parts per minute on a Bihler GRM 80P stamping-and-bending machine or at up to 360 parts per minute on a Bihler BZ 2-7 processing center or a Bihler MC 120 Multicenter.



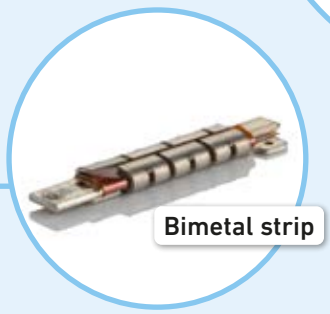
Arc extinguisher
In circuit breakers, the arc extinguisher, which is also known as a deionization chamber, extinguishes the arcs that typically occur in the event of a short-circuit. Arc extinguishers consist of a set of metal plates that are electrically isolated from each other. The fully-machined components can be manufactured highly efficiently on a Bihler GRM 80E or Bihler GRM 80P stamping-and-bending machine, sometimes at speeds of up to 220 parts per minute.

Trip mechanism
The positive trip mechanism is a key element of the circuit breaker. It ensures that the breaker trips immediately in an emergency, even if the switch is pressed or held in the "On" position. The trip mechanism can also be used to reset the circuit breaker manually after it has tripped or has been deliberately used to interrupt the current. This free-moving component can be manufactured, for example, on a Bihler BIMERIC BM 4500 servo production and assembly system, which includes the infeed of the individual parts and their combination into a subassembly. The individual parts themselves can be produced using progressive manufacturing techniques or on Bihler systems.





Moving contact



Bimetal strip

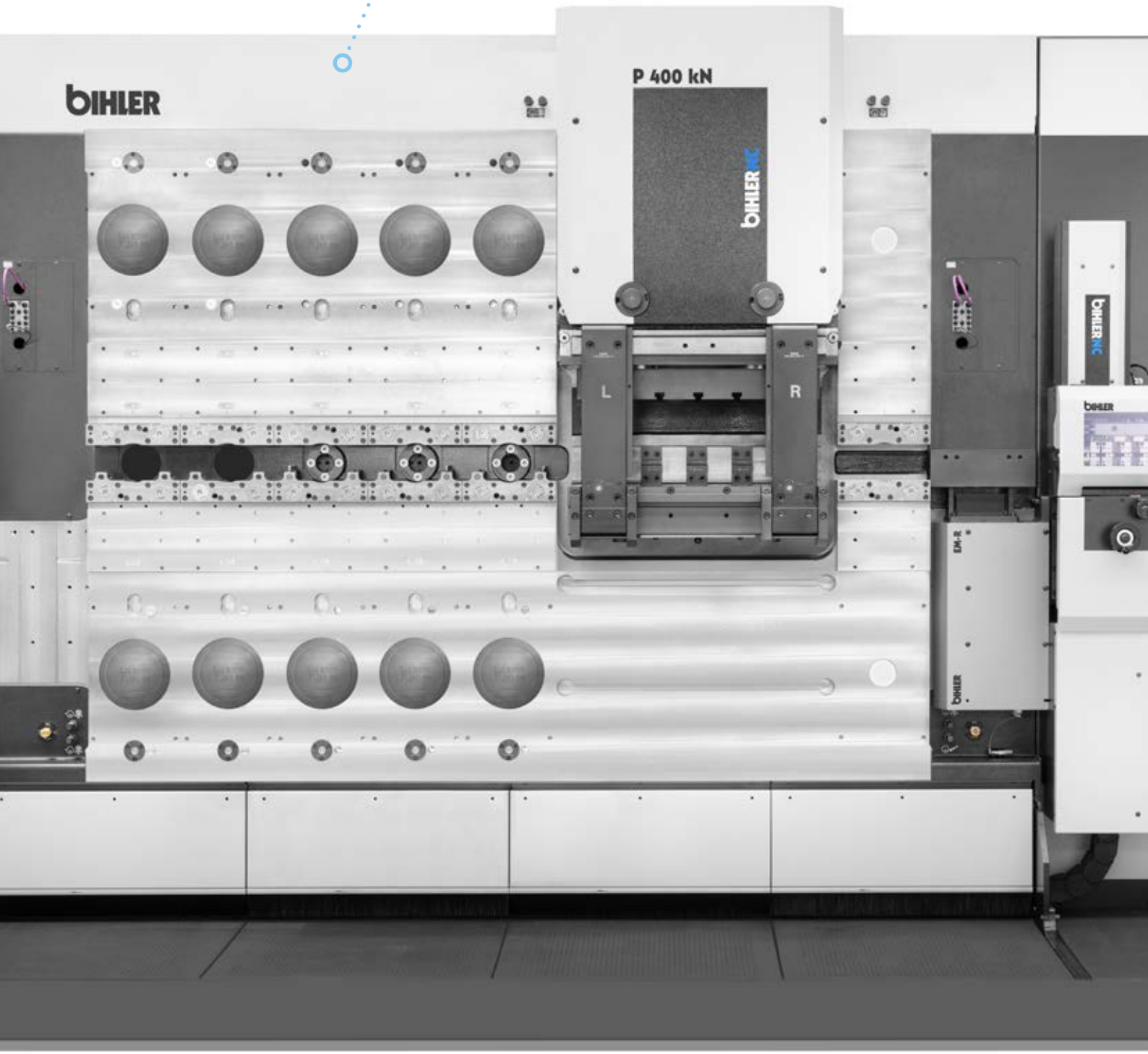
Box terminal

Isolator

Thermal assembly
The thermal assembly causes the electric circuit to be interrupted if the electric current intensity results in overheating. The circuit is broken by means of a bimetal strip that bends further in the presence of high temperatures and actuates mechanical elements that cause the moving contact to separate from the fixed contact. The thermal assembly also comprises a moving contact and a box terminal. The complete assembly can be manufactured as a finished unit on a Bihler BIMERIC BM 4500 servo production and assembly system at a maximum speed of 120 parts per minute. The manufacture of the required individual components can be integrated in the overall process and the parts can also be fed in preassembled. ●

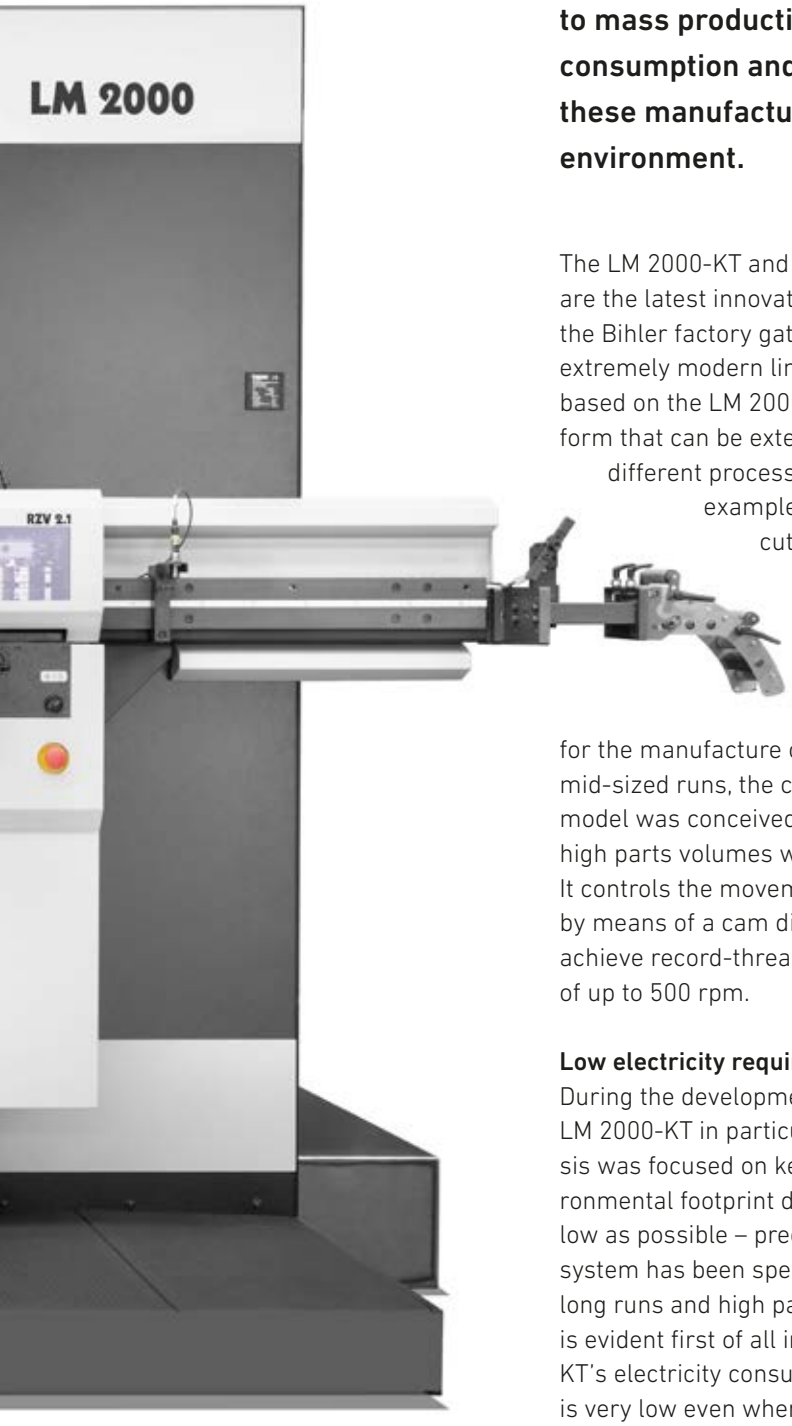
ENVIRON

Thanks to its low electricity consumption and integrated waste-free recirculating oil system, the environmental footprint of the Bihler LM 2000-KT is particularly low even at cycle times of up to 500 rpm.



MENTALLY FRIENDLY

As the latest generation of Bihler systems, the LM 2000-KT/ -NC machines stand for highly-efficient, modular component manufacturing and offer capacities that extend right through to mass production. What is more, their extremely low energy consumption and integrated recirculating oil lubrication make these manufacturing solutions particularly friendly to the environment.



The LM 2000-KT and -NC systems are the latest innovations to leave the Bihler factory gates. They are extremely modern linear machines based on the LM 2000 machine platform that can be extended by many different processes as required, for example welding, thread cutting and screw insertion. While the servo-controlled NC variant has been designed for the manufacture of small to mid-sized runs, the cam-controlled KT model was conceived for medium or high parts volumes with few variants. It controls the movements of the tools by means of a cam disk, allowing it to achieve record-threatening cycle rates of up to 500 rpm.

Low electricity requirement
During the development of the LM 2000-KT in particular, great emphasis was focused on keeping the environmental footprint during operation as low as possible – precisely because this system has been specially designed for long runs and high parts volumes. This is evident first of all in the LM 2000-KT's electricity consumption, which is very low even when the machine is working at high speed. This means that the machine's energy requirements can be met without difficulty by means of an appropriate solar power installation. As a result, this Bihler machine can run using renewable energy and without having an impact on the environment. If it is also used to machine so-called green, ideally CO_2-free, steel then even CO_2-neutral end-products are theoretically conceivable – a consideration that will play an ever greater role in the market and among customers in the future.

No waste Another important environmentally beneficial feature of the LM 2000-KT/-NC systems is the fact that both machines possess an integrated recirculating oil system. This ensures that the oil is pumped in a closed circuit to all the machine units and that there is absolutely no wastage or loss of oil. Oil consumption is therefore greatly reduced on all these systems compared to conventional machines.
Overall, the LM 2000-KT/-NC systems are innovative manufacturing solutions that not only permit highly-efficient component production, including at mass production levels, but also offer enormous benefits at the level of environmental and climate protection. ●

RESOURCE

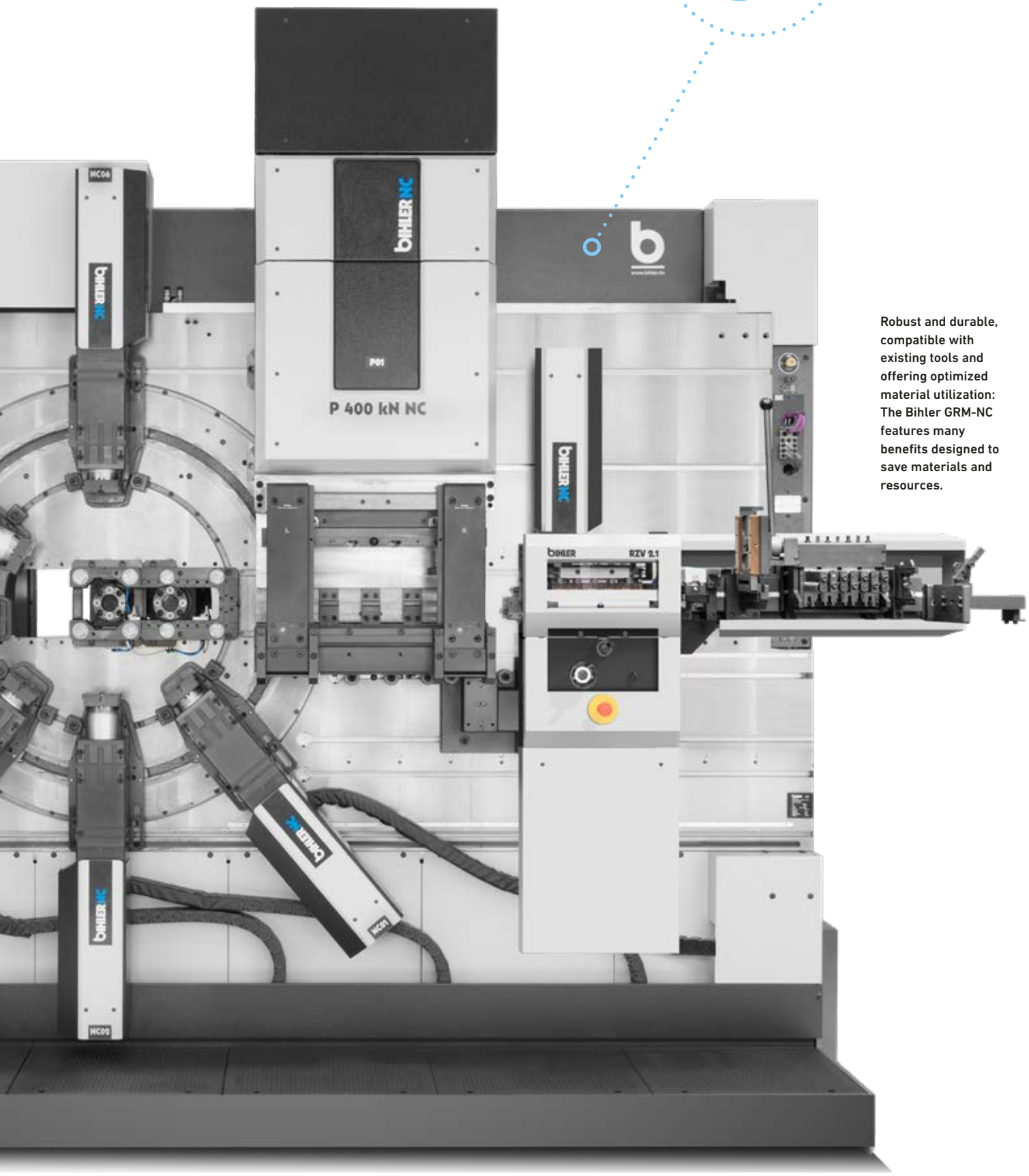
The Bihler GRM-NC is a flexible multipurpose machine that has been specially designed for small to mid-sized runs. The system's long service life, its compatibility with existing tools and the efficient use of materials during manufacture make it possible to save large quantities of valuable resources.

The Bihler GRM-NC servo stamping-and-bending machine is the ideal solution for the flexible, highly-productive manufacture of stamped-and-bended parts made from strip and wire material, round components and follow-up parts using radial and linear manufacturing technology. It is a multi-purpose machine designed for fast tool changes that excels, in particular, during the manufacture of small to mid-sized runs and achieves production speeds of up to 250 parts per minute. However, the GRM-NC stands out not only for its high performance but also because of its contribution to sustainability and resource-efficiency. Thus, the servo stamping-and-bending machine is robust and durable thanks to the use of high-grade materials and needs practically no replacement parts in normal operation.

Trouble-free adaptation The fact that it is not generally necessary to manufacture any new tools for the GRM-NC makes the solution even more resource- and materials-efficient. This is because existing tools that used to run, for example, on a mechanical Bihler GRM system can easily be adapted for the GRM-NC. One positive side-effect is that these tools can run considerably faster on the GRM-NC and achieve up to a 300 percent increase in output. What is more, setup times can be reduced by a factor of ten. And if new tools are needed then these can be created quickly and economically with the Bihler LEANTOOL system, which uses a high proportion of high-precision standard parts boasting a materials-efficient design.

Optimized material utilization
Naturally, the GRM-NC also saves large quantities of materials and resources in practice during the manufacture of the components. Ultimately, the Bihler radial bending formula, i.e. strip width equals part width, also applies here and only one stamping strip is required for linear bending. What is more, all operations can be performed so precisely that the quantities of offcuts and waste material are reduced to the very minimum. This is a benefit that pays for itself very quickly in round-the-clock operation and, in particular, when machining high-cost input materials.
Taken together with the high performance, versatility of use and the outstanding tool compatibility, these many different material and resource savings make the GRM-NC a modern, forward-looking manufacturing solution. ●

SAVING



Robust and durable, compatible with existing tools and offering optimized material utilization: The Bihler GRM-NC features many benefits designed to save materials and resources.

KIND

The Bihler BIMERIC Modular servo production and assembly system permits the end-to-end manufacture of components and complete assemblies. The strategy of bundling all the work operations together in a single machine ensures outstanding production efficiency that is compatible with the demands of climate protection because the high logistics and materials requirements of conventional processes are completely eliminated.

The Bihler BIMERIC Modular servo production and assembly system is the ideal solution platform for the exceptionally efficient manufacture of components and complete assemblies. This is because the BIMERIC's modular design not only permits stamping and bending but also supports the unproblematic integration of additional operations, such as thread cutting, screw insertion, welding, feed operations and the incorporation of external parts, in a single end-to-end system. The clear, modular separation between the stamping, bending and assembly processes ensures end-to-end continuous-flow manufacturing using standardized process modules on a single machine – at speeds of up to 250 cycles per minute.

Extensive CO_2 savings The outstanding efficiency of all Bihler BIMERIC machines also makes a huge contribution in terms of environmental and climate protection. This is because production on the Bihler BIMERIC is fully automatic – right through to the finished component. Semifinished components do not – as is often otherwise the case – have to be transported by truck to another site

The climatic and CO_2-related impacts of a component manufactured on a Bihler BIMERIC can be far less than those of a part produced using conventional processes.

Whereas conventional production procedures involve multiple steps, the BIMERIC Modular makes it possible to complete the entire manufacturing process on one and the same system.

TO THE CLIMATE

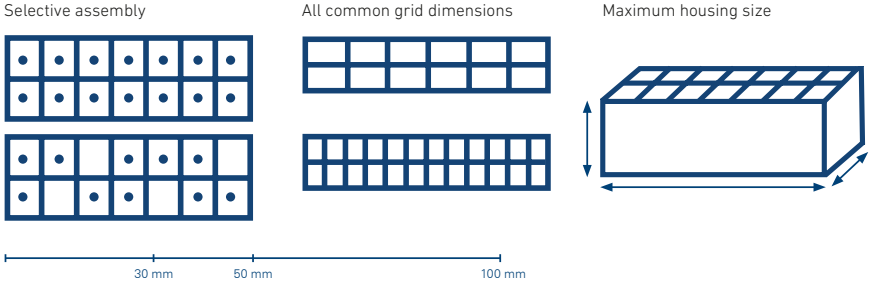
for further processing or final assembly, thus saving huge quantities of climate-threatening CO_2. The need for customer-specific special machines, which would otherwise have to be constructed to feed the metal parts or for final assembly, for example, is also eliminated. This also reduces the CO_2 load because far less additional material in the form of steel, electronic components and cables has to be manufactured and processed.

Enhanced eco-assessment It was already possible in the past toreplace all types of conventional deep-drawing processes with new process technologies based on the Bihler BIMERIC platform. One example of this is the process used at Freudenberg GmbH & Co. KG in Weinheim, Germany, whose ingenuity has been rewarded with the German Innovation Award. Here, a Bihler BIMERIC has brought about an 85-percent reduction in materials consumption during the manufacture of seals – and because there is also no need for any environmentally harmful lubricants, annual CO_2 emissions have been reduced by approximately 2,700 tonnes. The climatic and CO_2-related impacts of a component manufactured on a Bihler BIMERIC can therefore be far less than those of a part produced using conventional processes, such as deep-drawing. ●

FAST, FLEXIBLE PIN PLACEMENT

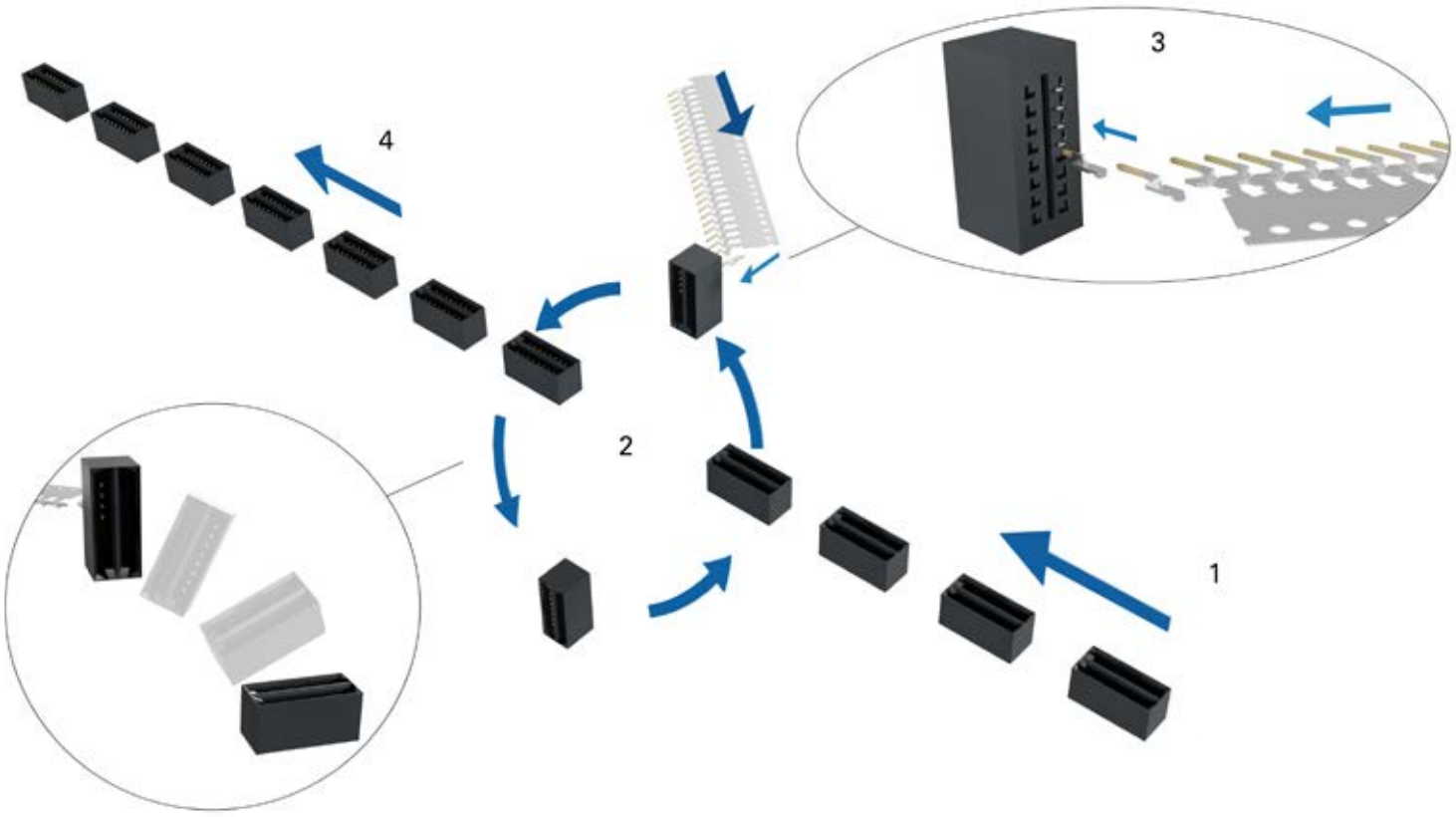
Otto Bihler Maschinenfabrik has developed the stitching process for manufacturing plug connectors. This is fast enough to permit the highly flexible insertion of up to 600 pins per minute. At the heart of this process lies the newly developed insertion module, which can be used on both a Bihler BIMERIC and a Bihler BMK-NC.

Whether in vehicles, computers or medical applications, plug connections are playing an ever more important role in the digital world and demand for them is constantly growing. The most commonly used connections take the form of cable-to-board, board-to-board and hybrid connectors in SMD, THT or also press-fit technology. They can contain straight pins, angled pins as well as blade and spring contacts. Otto Bihler Maschinenfabrik has developed the so-called stitching process for the assembly of these precision products. "Our stitching process was specially developed for the variable, extremely high-speed production of a wide range of plug connector types," explains Kay Wesendrup, Key Account Manager Connector Industry at Bihler. "At the heart of the process is the stitching operation, that is to say the insertion of the pins at the housing. This can be done extremely flexibly and precisely thanks to Bihler's high-performance servo technology."



For the most varied layouts The immensely high performance of the stitching process developed by Bihler can be clearly seen in the fact that a connector housing can be equipped with up to 600 individual pins per minute. Thanks to the combination of Bihler servo and control technology, the insertion/stitching process can be performed extremely flexibly irrespective of the orientation, number, grid dimensions and layout of the pins. Using the Bihler stitching process, it is therefore possible to assemble many different types and categories of housings, and selective pin layouts and insertion positions can be achieved without difficulty.

Pin insertion module at the heart of the solution The pin insertion module lies at the very heart of the Bihler stitching process. This is responsible for handling the housing



Overview of connector production, with infeed of the contact housing (1), insertion in the workpiece carrier (2), separation of the pins (3) and removal of the fully-assembled housing (4).

and actually inserting the pins. This NC-assisted process is performed both horizontally and vertically. More specifically, the process starts with the infeed of the contact housing (1), which is then placed in the workpiece carrier (2). The workpiece carrier and housing are then transferred to the pin insertion position. At the same time as this is happening, the carrier strip is moved forward and the pin is separated or removed from the strip (3). The pin is inserted in the intended position in the housing before the housing itself is then rotated and the second row is inserted. The fully assembled housing is then removed from the workpiece carrier again and exits the process (4).

Full automation also possible The pin insertion module and, therefore, the entire Bihler stitching process can be integrated without difficulty in a Bihler BIMERIC servo production and assembly system, for example. However, Otto Bihler Maschinenfabrik has also developed the Bihler BMK-NC for such applications. This constitutes the basic machine and comprises the machine bed, the electrical equipment and machine controller, the strip feed module for feeding the pre-stamped pins, a press module containing the separating tools and the pin insertion module for stitching the pins in the horizontal and vertical directions. The basic machine can then be equipped with various modules from a sort of application toolkit in order to meet customer-specific needs in the field of plug contact assembly. Thanks to the modular structure, multiple BMK-NC units can be arranged next to one another, consequently making it possible to machine different pin lengths and thicknesses depending on the complexity of the plug connector in question. The Bihler BMK-NC can also be equipped with application modules to permit the fully automatic production of large runs. ●

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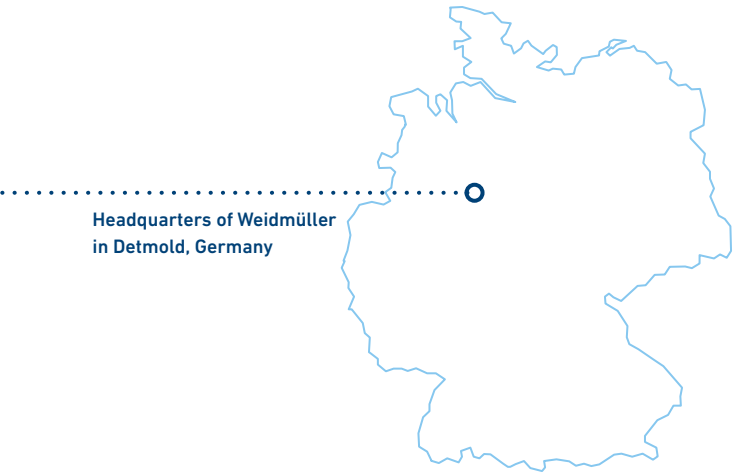
ON A NEW LEVEL

Output doubled **Setup times halved**

Large increases in demand volumes for an innovative flat spring persuaded the Weidmüller Group to transfer production, together with the associated manufacturing tools, from a Bihler GRM-NC to a new Bihler LM 2000-KT. This Bihler system, which has been specially designed for mass production operations, has doubled output to 500 parts per minute and has further improved the already impressive quality of the components.

Wladimir Enns, Head of the Stamping/Bending department at Weidmüller, and Kay Wesendrup, Bihler Key Account Manager Connector Industry (right), with the stamping strip for the flat springs that are used in Weidmüller's terminal strips, for example.



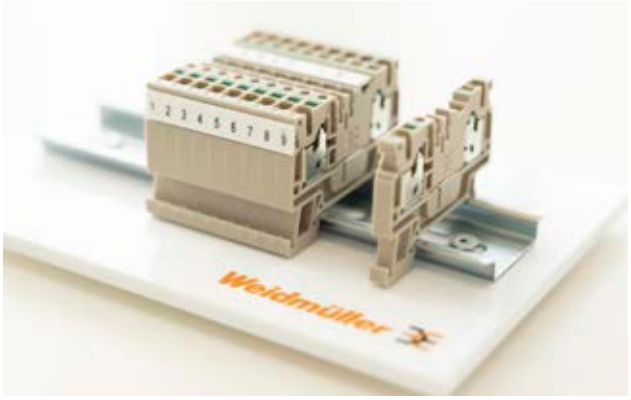
Headquarters of Weidmüller in Detmold, Germany

Manufacturing some 6.9 billion parts per year, the Weidmüller Group is the world's leading supplier of solutions for electronic connecting and automation technology. The company, which was founded in 1850, has a portfolio of approximately 60,000 different parts and components for these sectors. "60 percent of our metal parts are stamped-and-bended parts," explains Wladimir Enns, Head of the Stamping/Bending department at Weidmüller. "These are characterized by their outstanding component quality, high production speeds and a high technical capacity utilization level." Otto Bihler Maschinenfabrik, with which Weidmüller has been cooperating very successfully for decades, accounts for a significant proportion of this capacity. This all started back in 1971 with a Bihler RM 35, and the company

now possesses a total of 77 Bihler systems. "The performance of the machines and their low downtimes are crucial. And if a replacement part is needed from time to time, then Bihler ensures fast, reliable provisioning," explains Enns. Even though Weidmüller still has many older Bihler systems in its machine pool, the company places great emphasis on innovation for its future development and is also equipped with the most recent Bihler technology. One recent example is a Bihler GRM-NC, which has been in productive use since 2022 and for which there are now eight LEANTOOLs.

Patented "SNAP IN" system "The acquisition of Bihler's servo technology and LEANTOOL system marked a sea change in our stamping-and-bending strategy," explains Enns. It brought about a significant reduction in tool costs and minimized setup types. One of the products that Weidmüller manufactures on the Bihler GRM-NC using Bihler LEANTOOL tools is the "SNAP IN" spring – a spring element that is used in the innovative "SNAP IN" connector technology. Weidmüller uses this technology in its terminal strips as well as in other components. What makes this patented system so special is that it permits the automatic insertion of conductors thanks to the automatic release and engagement of pre-tensioned springs. No tools are needed to insert the wires and so the entire process can be performed automatically by robot. According to Enns, "the crucial factor is the high precision of the springs, which have tolerances down to a hundredth of a millimeter. We can achieve this

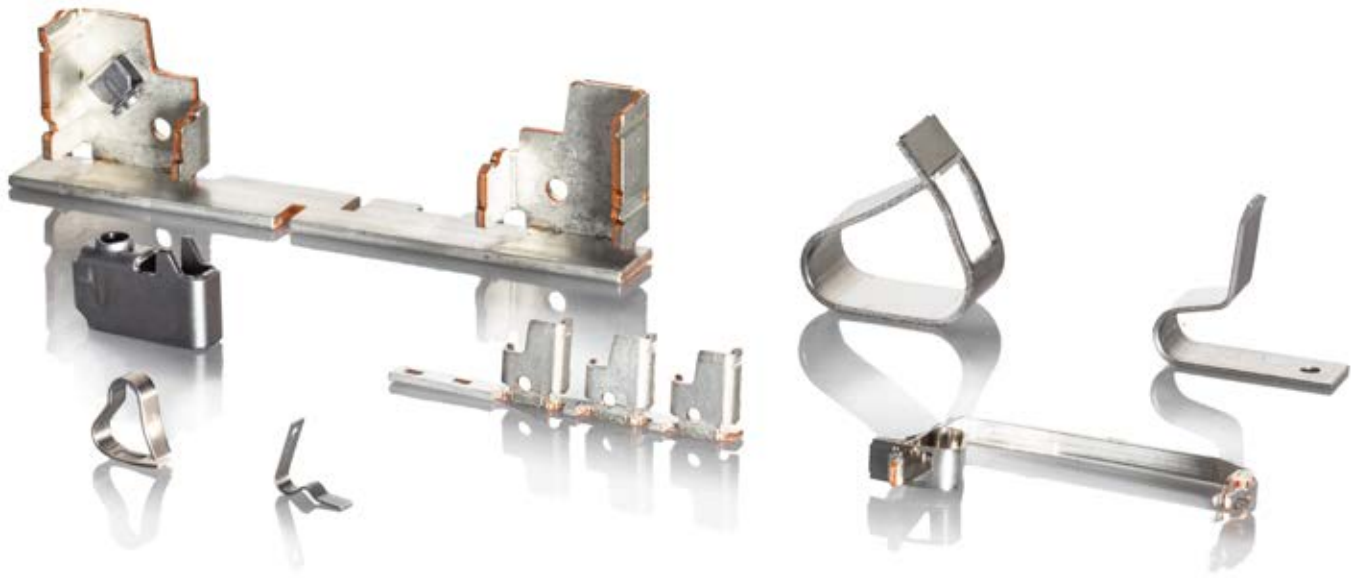
According to Enns, the crucial factor is the high precision of the springs, which have tolerances down to a hundredth of a millimeter.



The innovative "SNAP IN" connector technology permits the automated insertion of conductors thanks to the automatic, tool-free release and engagement of the pre-tensioned springs.

outstanding quality without difficulty at a speed of 250 strokes per minute on our Bihler GRM-NC."

Perfect for mass production The Weidmüller Group has now decided to go a step further in its manufacturing technology with a new Bihler LM 2000-KT. This innovative system will be taken into service in early 2024. The machine will take over production of the millions of "SNAP IN" springs that are now required due to the product's huge market success. Enns: "With the new Bihler LM 2000-KT, we expect to see a considerable increase in throughput from the current 250 to a future 500 parts per minute. One vital factor for us is that we will be able to use many of the tools from the Bihler GRM-NC on the Bihler LM 2000-KT. At the same time, we expect the new Bihler LM 2000-KT to bring about a further improvement in the already high quality of these components by further increasing manufacturing precision."



As of 2024, the "SNAP IN" springs will be manufactured on a new Bihler LM 2000-KT.

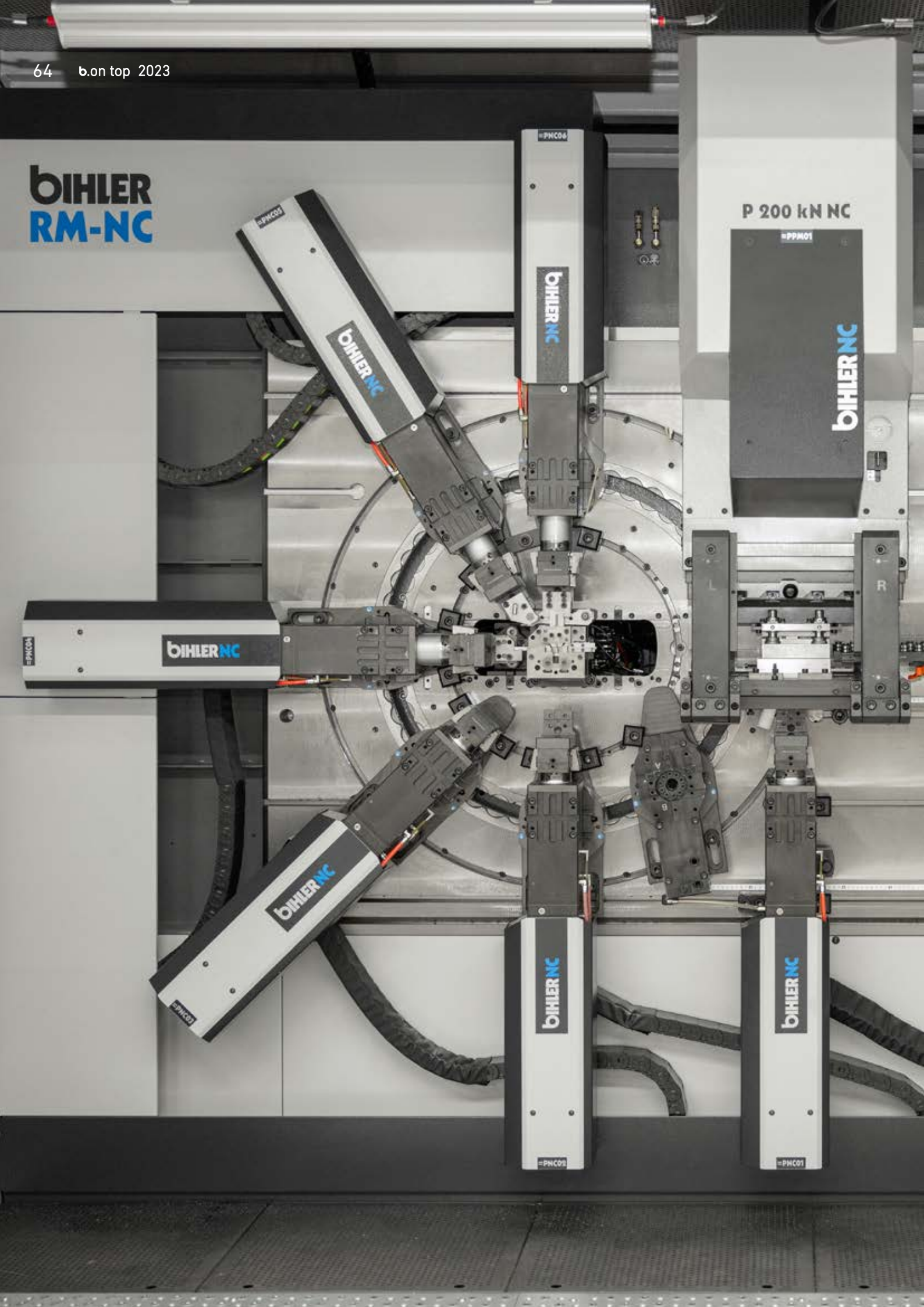
And this expectation is fully justified because the system has been specifically designed to achieve such ambitions: "The machine frame of the Bihler LM 2000-KT is particularly rigid and robust, and the same is true of the fully lubricated machining unit slides and the twin-seated cams," explains Kay Wesendrup, the Bihler Key Account Manager for the Connector Industry, who has been responsible for the Weidmüller project from the very beginning.

A real bonus – compatibility Enns sums up as follows: "We are confident that we can successfully achieve further performance and quality improvements with the new Bihler LM 2000-KT. It is the optimum solution for the efficient, high-quality production of components, while simultaneously increasing output from small to mid-sized runs and right through to very large parts volumes. Another bonus for us is the compatibility between the two systems: We can switch our tools from the Bihler LM 2000-KT back to the Bihler GRM-NC at any time, giving us extra flexibility." ●

Weidmüller

The **Weidmüller group of companies** is the global market leader in the field of Smart Industrial Connectivity and supplies its customers and partners worldwide with products, solutions and services in the industrial power, signals and data fields. The company, which was founded in 1850 and has its head office in the German city of Detmold, has a workforce of some 6,000 employees worldwide and is present in more than 80 countries. In 2022, Weidmüller achieved sales of 1.175 billion euros.

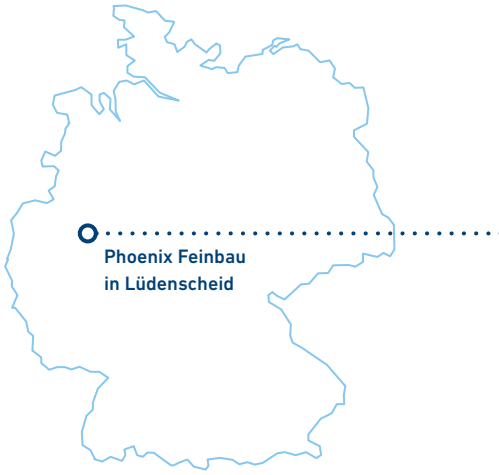
www.weidmueller.de


BIHLER
RM-NC
P 200 kN NC
BIHLER NC

SIGNIFICANT EFFICIENCY BOOST

Cycle times increased by 260 percent **Setup times cut by 50 percent**

At the end of 2022, PHOENIX FEINBAU, a member of the Phoenix Contact Group, invested in a Bihler RM-NC. This step went hand-in-hand with the transfer of products from the earlier cam-controlled Bihler machines to the new servo-controlled Bihler RM-NC. This has increased cycle times for the selected products by up to 260 percent while also more than halving setup times and is intended to replace three existing in-house RM 40 systems after a project lead time of approximately one year. The company has benefited from the enormous increase in performance for small, mid-sized and also high-volume runs.



Phoenix Feinbau GmbH & Co. KG in the German city of Lüdenscheid has been manufacturing stamped parts, stamped-and-bended parts and plastic products since 1939, that is to say for more than 80 years. The majority of these parts are springs of various shapes and sizes that are installed in electronic components and products. The company, whose workforce of some 900 employees now produces exclusively for the Phoenix Contact Group, owes its decades-long success to a clear strategy: "As a long-established part of the Phoenix Contact Group, we achieve a particularly high level of vertical integration and value-added and this makes us relatively independent of our suppliers. The very high delivery performance that this has allowed us to achieve meant, for example, that we were able to further grow our sales during the pandemic," explains Bernd Simanski, Group Head for Stamping and Bending Operations at Phoenix Feinbau. "We also have a very service-oriented approach and offer single-source, end-to-end solutions – from the initial development inquiry, through design and tool manufacture and on to production," adds Sascha Plate, Workshop Supervisor at Phoenix Feinbau.

Extensive Bihler machine pool Otto Bihler Maschinenfabrik has also made a vital contribution to Phoenix Feinbau's outstanding performance capabilities. The two companies have been working together since the late 1970s and Phoenix Feinbau now has a total of more than 60 Bihler systems. "Then as now, the great advantage of our Bihler systems lies in the fact that they offer outstanding versatility at low tool costs. At the same time, they also permit extremely material-efficient production," stresses Simanski. "Even now, the extremely complex setup processes demand good, highly-qualified personnel, whereas more modern systems require excellent programming rather than mechanically-oriented skills in order to achieve the significantly faster cycle times."

Benefiting in many different ways from the new Bihler RM-NC: Bernd Simanski, Group Head for Stamping and Bending Operations (right), and Sascha Plate, Workshop Supervisor.

Clearly defined targets In early 2022, in its desire to significantly boost its manufacturing efficiency in this product sector, the company decided to introduce Bihler's NC technology by acquiring a Bihler RM-NC stamping-and-bending machine. "Our aim was to transfer production from the mechanical RM 40 system to the Bihler RM-NC and in this way not just cut setup times from eight to three or four hours but also to increase the machine cycle speed from 60 to up to 220," confirm both Simanski and Plate. To do this, the company adapted a number of its existing tools for use on the new Bihler RM-NC, which commenced test operation in September 2022. It started by manufacturing a very wide range of trial components of differing geometries and made from different materials – from spring clips, tension springs and oversprings, through PCB stops and on to plug connectors.

Enormous potential The result: "We have been able to run the new Bihler RM-NC at a speed of 220 strokes per minute without difficulty," report Simanski and Plate. "The great increase in manufacturing speeds of more than 260 percent surprised even our experienced employees. At the same time, we were able to cut setup times as planned while also improving quality. The sensational results clearly show that a single new Bihler RM-NC has the potential to replace up to three legacy Bihler RM 40 systems."

An enthusiastic workforce The new NC technology has been particularly well received by the younger employees. As machine fitter Daniel Reinhardt and toolmaker David Tlatlik report: "It's great fun working with this technology. You can design the workflows as you want and are no longer bound by the cams. What's more, the fiddly adjustment operations that you had to do in the past are now mostly possible just by pushing a button."

Tool costs pay for themselves Six fully-adapted tools are now being used on the new Bihler RM-NC, which has already produced approximately eleven million parts. "We are benefiting from both the shorter setup times and the increased throughput," stresses Simanski. The decision has already been made to adapt another eight tools. And that, too, will be well worthwhile: "The costs of adapting the tools pay for themselves within a year thanks to the increased throughput and the shortened setup times," explains Simanski.

The new system has been a worthwhile investment for the company, not only for small and mid-sized but also for large runs.

Further replacements planned The company looks back equally positively on its decision to acquire Bihler NC technology: "The decision to enter the world of Bihler NC technology was absolutely right for us and we have benefited from it in many different ways," is how Simanski and Plate sum things up. "Our aim is to invest in another RM-NC and replace some of our existing RM 40 machines – but not all of them: We will keep the RM 40 systems that we use for large-scale production in the future." ●

Phoenix Feinbau GmbH & Co. KG is a metalworking company based in Lüdenscheid, Germany. The company has more than 80 years of experience in the metalworking industry. The workforce of almost 900 manufactures metal stamped and stamped-and-bended parts as well as plastic parts used in the manufacture of electronic components and products for the Phoenix Contact Group. Operating under an umbrella brand name, Phoenix Contact supplies innovative products, solutions and digitalization skills for the electrification, networking and automation of every industrial and infrastructural sector. In this way, the family-run company is supporting industry and society in the transformation to a sustainable world with long-term growth opportunities for all. Phoenix Contact has a workforce of around 22,000 employees and achieved sales of 3.6 billion euros in 2022. It manufactures in a production network spread across eleven countries with varying levels of vertical integration.

www.phoenixcontact.com

Scheuermann + Heilig GmbH
in Buchen-Hainstadt

VERSATILE ENOUGH FOR COMPLEX TASKS

New, highly-complex hybrid parts possible → Technological lead extended

Scheuermann + Heilig GmbH in Buchen-Hainstadt, Germany has long been a user of Bihler technology. Its latest acquisitions include five Bihler BIMERIC servo production and assembly systems. These are giving the family-run company a whole new range of possibilities in the manufacture of highly-complex hybrid components – such as a power connector for electric vehicles that is manufactured fully automatically on a Bihler BM 4500 in a process involving approximately 100 steps.

Focus on outstanding precision: Head of Production Andreas Pleschko with the new power connector.

Fascinating technology: Silke Heilig with the carrier strip for the new power connector.

Scheuermann + Heilig GmbH was founded in 1957 in Buchen-Hainstadt, to the north-west of Heilbronn. The focus of this family run business consists in the development and production of complex, hybrid metal and plastic assemblies. In addition to stamped and stamped-and-bended parts that are manufactured fully automatically and in many different variants, the product portfolio also includes a wide range of extremely tough, individually designed wireform parts. The crucial factors in Scheuermann + Heilig's success are its expertise dating back over 60 years, its constant desire to improve, as well as its high-performance machine pool and highly-efficient production technology. That is why Scheuermann + Heilig has for decades counted on Otto Bihler Maschinenfabrik as a reliable partner and now possesses over 95 Bihler systems. "Bihler's systems have always opened up new possibilities for us, in particular in terms of versatility, component quality and additional assembly options," explains Andreas Pleschko, Head of Production. Robin Arnold, who is responsible for project launch management, agrees: "Bihler enables us to cope with particularly high levels of complexity and offers us an extremely wide range of manufacturing options." This is particularly true of the most recent Bihler systems installed at Scheuermann + Heilig. These include four Bihler BM 4500 servo-controlled production systems as well as a BM 3000. "The systems are particularly versatile in operation," explains Pleschko. "You can extend the machine and the process from all sides, integrate an enormous variety of machining steps, such as assembly, thread cutting and laser welding, and feed in a range of very different materials and combine these to create a great variety of hybrid components."

A highly-complex process One current example of a complex hybrid part that Scheuermann + Heilig manufactures on a Bihler BM 4500 is a 48-V power connector for electric vehicles. Pleschko makes the problem clear: "The particular difficulty lies in the need to insert an open-ended, extremely flexible cladding into a closed surround with absolute precision and without the slightest distortion." "The whole process also has to run fully automatically, without errors and at high speed," adds Markus Farrenkopf, Technical Coordinator. This is no easy task because the manufacture of the connector comprises a total of approximately100 different steps. It starts on the Bihler BIMERIC BM 4500, where the strip material is introduced from both sides via the Bihler RZV 2.1 radial gripper feed. The strip is then stamped by the 30-tonne press and the various bending operations necessary to produce the two housing bodies are performed. As of approximately half way along the machine, the inner body, which is only 0.2 millimeters thick, is transferred to the second machining side via a rotary table and engages in the already manufactured, additionally welded outer body. After this, the two elements are spot-welded together at the front face using a laser in order to ensure that the inner component is securely seated. The plastic parts are then mounted. Finally, a camera inspection is performed to ensure flawless component quality.

Production of the connector involves approximately 100 different manufacturing steps on the Bihler BIMERIC BM 4500.

Scheuermann + Heilig GmbH is headquartered in Buchen-Hainstadt to the north-west of Heilbronn.

Speaking the same language Scheuermann + Heilig now produces both angled and round variants of the power connector on the Bihler BIMERIC BM 4500. The development time required for this extraordinary manufacturing solution amounted to approximately six months. "In projects like this, we are always very well supported by Bihler. The fact that Bihler assigns us a personal, central contact person for all our inquiries and questions is a great advantage. We benefit from service from a single source, something that goes back to the shared history of our two family-run companies: We just know one another and we speak the same language," explains Silke Heilig who, together with Steffen Scheuermann, is responsible for managing the company.

Extending the technological lead Scheuermann + Heilig has now been working successfully with Bihler's servo production systems for many years. Andreas Pleschko has absolutely no doubts: "With our Bihler BIMERIC systems, we have once again extended our technological lead. In this way, we can offer our customers from the mobility, smart solutions, medical and individual solutions sectors highly-complex components that allow them to continue to be successful in their markets." "At the same time, we can also keep in step with the continuing trend toward component miniaturization and, for example, manufacture small connectors in very high quality," adds Farrenkopf. This all puts the company in a very strong position for the future, in particular given that it will soon be further extending its performance and production expertise by acquiring a new Bihler BIMERIC BM 6000. ●

SCHEUERMANN + HEILIG
Performing Perfection

Scheuermann + Heilig GmbH was founded in 1957 and manufactures hybrid assemblies, stamped parts, stamped-and-bended parts and wireform parts at its sites in Buchen-Hainstadt and Atibaia (Brazil). The company has a workforce of approximately 600 employees and manufactures some 3,500 different products every year, including for the e-mobility and medical engineering sectors. In 2022, the company achieved sales of approximately 90 million euros.

www.sh-gmbh.de

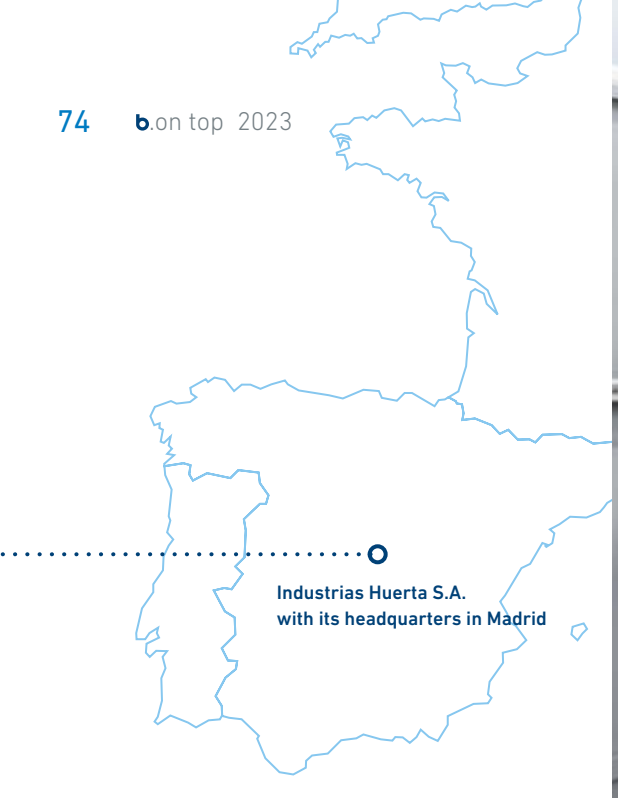
PERFORMANCE IS THE CRUCIAL FACTOR

Tool developed in-house **60 to 80 parts per minute**

For decades, the Madrid-based company Industrias Huerta S.A. used mechanical Bihler systems to produce its wire and stamped-and-bended parts. However, to manufacture new components for the automotive industry, this long-established company has now invested in a Bihler GRM-NC. The system is not only paying for itself in economic terms but is also enriching the parts manufacturer with a whole range of new production capabilities.

Industrias Huerta, which was founded in Madrid in the 1950s, specializes in the development, manufacture and marketing of technical metal parts that are used in the electrical and mechanical solutions produced in a wide variety of industries. While Industrias Huerta's product portfolio has constantly changed with the times, the company's motto has always remained the same: "Our customers and their needs have always been our top priority" explains CEO Valentín Huerta, son of the company's founder José Huerta. "We offer high-quality products at competitive prices together with – and this is absolutely characteristic of us – an exceptionally high level of customer proximity, service and support. I like to use the analogy of the hotel sector to illustrate what I mean: We are not a 1,000-room hotel with faceless guests where every room looks the same, but a small, elegant boutique hotel that knows its guests personally and gives them individualized attention."

Always concentrating on the customer's requirements: Moníca Huerta Rodriguez-Osorio und Valentín Huerta.



The linear tool for the new Bihler GRM-NC was developed in-house by Industrias Huerta.

Mechanical systems have proven their worth To bring its customer projects to fruition, Industrias Huerta relies primarily on its in-house design and toolmaking department, which can draw on 50 years of experience to accompany customers during product development. However, for the subsequent manufacture of the components, the company has long put its faith in technology from Otto Bihler Maschinenfabrik and it now has a total of approximately 30 machines. These are mostly mechanical systems, which provide Industrias Huerta with the best possible way of achieving its high component requirements. Their precision, robust construction and durability mean that many years have passed without the company having any need for new Bihler systems.

Back to Bihler But the times are changing and, with them, so too are the products that Industrias Huerta manufactures and the markets it serves. To allow it to offer more complex parts in the automotive sector, in particular, the company purchased a new Bihler GRM-NC-type stamping-and-bending machine. It uses the system, which arrived at the company in December 2022, to manufacture clips and fastenings for vehicle interiors along with a number of other products. "Even though we haven't bought any new systems for years, we went back to Bihler for this project," says Moníca Huerta Rodriguez-Osorio, who is responsible for finance at Industrias Huerta. "The analyses and calculations that we performed before taking this step showed that the Bihler GRM-NC was exactly the right system for us and the investment has been well worthwhile."

From strength to strength This new acquisition was not only driven by the fact that it would have been impossible for Industrias Huerta to manufacture the new, highly-complex vehicle components using its existing systems. Instead, the outstanding level of performance offered by the Bihler GRM-NC was another crucial factor. As a result, the system, whose linear tooling was developed in-house by Industrias Huerta, functions as an integrated, end-to-end machine that is able to perform every step in the production process. This includes the intake of the strip material as well as the stamping, bending and thread-cutting operations and the output of the finished component. Another important consideration is the machine's high operating speed, which is able to achieve throughput of up to a maximum of 60 to 80 parts per minute. "For us, another benefit of this machine lies in the fact that we can now manufacture even small and mid-sized runs much faster and more flexibly, something that wouldn't have been conceivable in the past due to the long setup times of our mechanical systems," stresses Raul Sánchez, the engineer responsible for the system at Industrias Huerta.

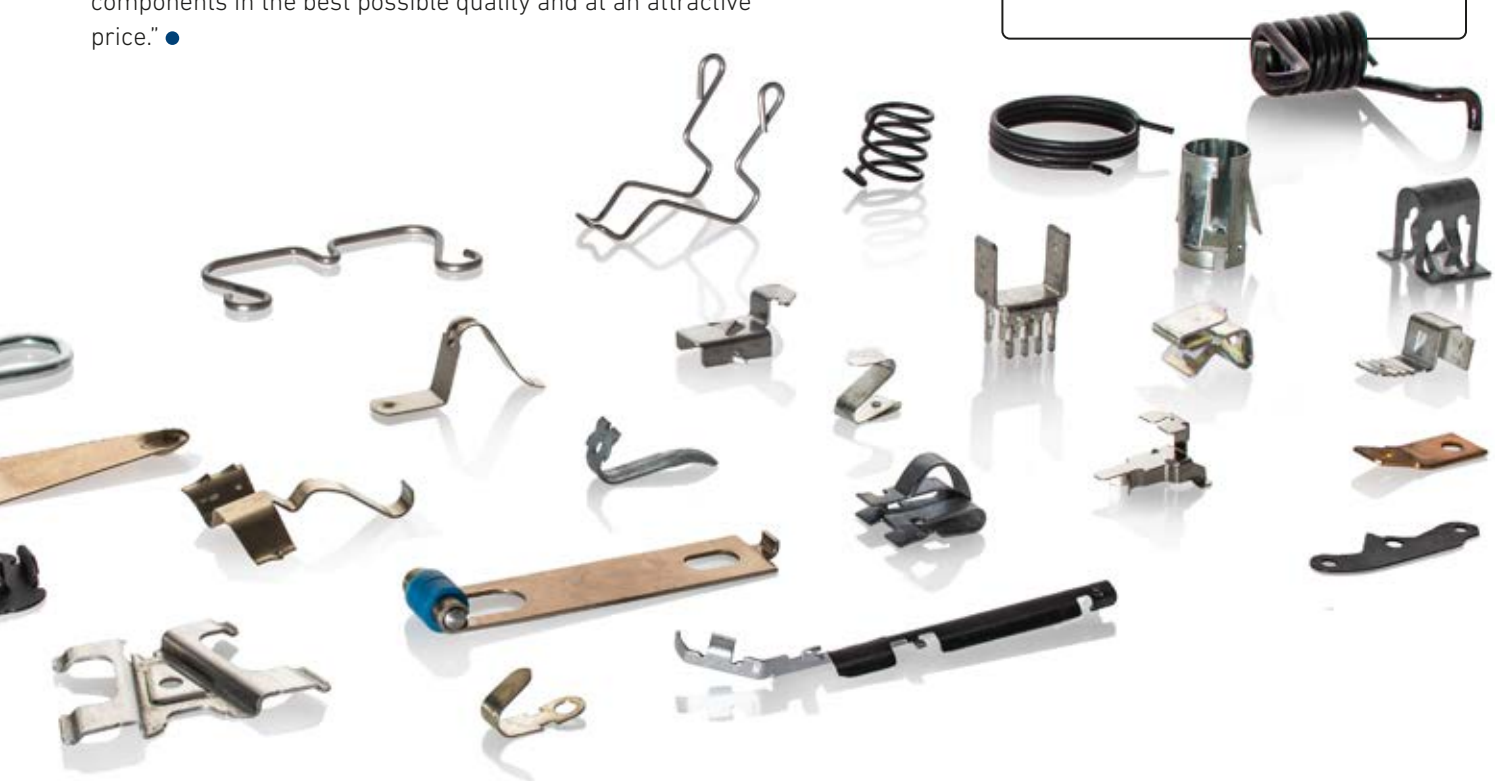
The Industrias Huerta and Bihler project team, including CEO Valentín Huerta (3rd from left) and engineer Rául Sánchez (left).

Value added for the future The new Bihler GRM-NC is now running successfully in practical applications at Industrias Huerta**.** Valentín Huerta and Moníca Huerta Rodriguez-Osorio sum things up as follows: "We are very pleased with the new system and our customers also appreciate the quality of the components that we manufacture on it. However, the machine also offers us a lot of value-added for the future because it quite simply gives us access to new manufacturing capabilities that we didn't have in the past. This means that we can supply our customers with new components in the best possible quality and at an attractive price." ●

IndustriasHuerta
Round and flat wire parts technologies

Industrias Huerta was founded in Madrid in the 1950s and is now managed by the third generation of the same family. In addition to its head office in Madrid, the company also has a commercial office in Brazil and a production site in Poland. Its product portfolio includes wireform parts, stamped and stamped-and-bended parts, compression and torsion springs and special parts. Its main customers are active in the automotive, electronic engineering, aeronautics, textiles and furniture industries.

www.industriashuerta.com



BREATH OF FRESH AIR IN THE NORTH

Throughput increased from 80 to 150 parts **Setup time cut from one day to two hours**

To bring together the most modern machine pool in the whole of northern Europe and dramatically increase its manufacturing efficiency – that is the stated aim of the Swedish EWES Group AB. One key element in this strategy is the new Bihler GRM-NC. It has practically doubled throughput for existing components and has reduced setup times by three quarters. By using this machine in combination with the Bihler LEANTOOL system, this long-established company is also able to manufacture completely new, complex components economically and competitively.

An enthusiast for technological craftsmanship: Anton Svensson with his historic Porsche 356 B, which he spent years restoring to its original state and now drives every day.

The history of EWES AB began back in 1935 in the southern Swedish city of Bredaryd. Here, metal-working specialist Einar Svensson and his wife Irma decided to start out in business on their own and began to produce metal springs and wire parts in a small shed. They supplied these products to manufacturers of toys, seats and bed parts. As the decades passed, the company continued to grow and the EWES Group is now a globally active group of companies. With its workforce of more than 120 employees, it has production operations in Sweden, Serbia, Bosnia and China, and the manufacture of steel springs continues to be this family-run company's core business.

All-round investments At present, a completely new era is dawning at EWES SE: "We have decided to invest

CEO Anton Svensson is the third generation of his family to manage this long-established Swedish company. It is currently investing heavily in state-of-the-art systems technology for the metalworking industry – with the aim of bringing together the most modern machine pool in the whole of northern Europe.

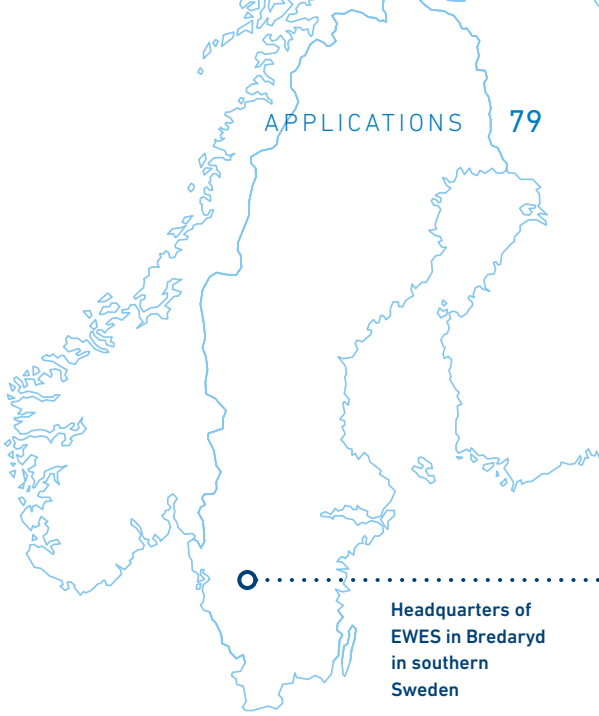
very heavily in the most recent systems technology for the metalworking industry. We want to bring together the most modern machine pool in the whole of northern Europe within our walls," explains CEO Anton Svensson, the grandson of the company's founder. "With the new machines, we can significantly reduce our energy consumption and improve our environmental footprint. However, at the same time, we are replacing numerous existing systems and winning back valuable space that we need in order to extend our storage facilities. Most importantly, though, the new systems are greatly improving our manufacturing efficiency: We can deliver faster and at lower cost, and that is naturally something our customers appreciate."

New horizons The list of new acquisitions at EWES SE is extremely impressive. It comprises three spring grinding machines, one tool grinding machine, one high-capacity press, one CNC spring-making machine and – the undisputed highlight – a new Bihler GRM-NC servo stamping-and-bending machine. "The Bihler system represents our largest investment," says Svensson with some pride. "We were placing very high expectations on this new system: In particular, we wanted to use Bihler's servo technology to manufacture new, complex component geometries in outstanding quality, while also optimizing our material utilization. We also expected to benefit from considerably shorter setup times and increased manufacturing speeds."

Maximized throughput, minimized setup times Soon after the system's arrival in Bredaryd, it became clear that the new Bihler GRM-NC would completely meet these high

The radial tool for manufacturing the spring strip was developed using Bihler's LEANTOOL system.

expectations. "After reinforcing the floor and opening up a large hole in the outside wall of our production building, we were able to move the eleven-tonne system into our machine hall in mid-February 2023 – and just a few days later, the system was already up-and-running," reports Peter Josefsson, Head of Maintenance at EWES.
The company started by manufacturing existing EWES products for the automotive sector on it. And then came the discovery: "With the Bihler GRM-NC, we were able to increase our average throughput from 80 to 150 parts per minute," emphasizes Svensson. "In parallel, setup times were reduced from a whole day to approximately two hours and, last but not least, the new machine once again improved the quality of our components."
Initially, manufacturing was performed using tools taken over from existing Bihler systems which EWES's technical team adapted for use on the new Bihler GRM-NC. "The effort involved in adapting the tools is manageable and we have already adapted a good half of our 25 or so existing tools," reports Josefsson.



Peter Josefsson, Head of Maintenance at EWES, at the controller for the new Bihler GRM-NC.

With Bihler LEANTOOL At the same time, EWES is also able to manufacture completely new components just as planned with the new Bihler GRM-NC. The best example is a spring strip that is needed in order to adjust the height of desks. "It is a relatively complex component that we wouldn't have been able to manufacture in the same way using our existing systems," explains Svensson. "On our new Bihler GRM-NC, by contrast, we can produce the part without any problems and also achieve very high material consumption efficiency." The radial tool used to perform this task is also completely new. It was constructed by EWES based on the Bihler LEANTOOL system, which has been available in the company since the end of 2022 and has also proved to be invaluable: "We have learned that we can manufacture tools up to 70 percent more cost-efficiently using the Bihler LEANTOOL concept."

Enhanced competitiveness Svensson sums things up as follows: "We are very satisfied with our investment. "It allows us to manufacture existing products much more efficiently and also to produce completely new parts economically. We have therefore become more competitive and are now able to manufacture many components in Sweden. That generates confidence among our customers and boosts our delivery capabilities." And EWES will continue to follow this course in the future. Consequently, this long-established Swedish company is planning to introduce another Bihler GRM-NC in 2026. ●

EWES GROUP

Springs move the world

EWES Group AB

The company, which was founded in 1935, is the oldest family-run manufacturer of springs in Sweden. Today, more than 120 employees in Sweden, Serbia, Bosnia and China concentrate primarily on manufacturing steel springs in thicknesses of 0.1-12 mm as well as stamped-and-bended parts of material thicknesses up to 3 mm. The company's main markets are in northern and eastern Europe as well as in Southeast Asia.

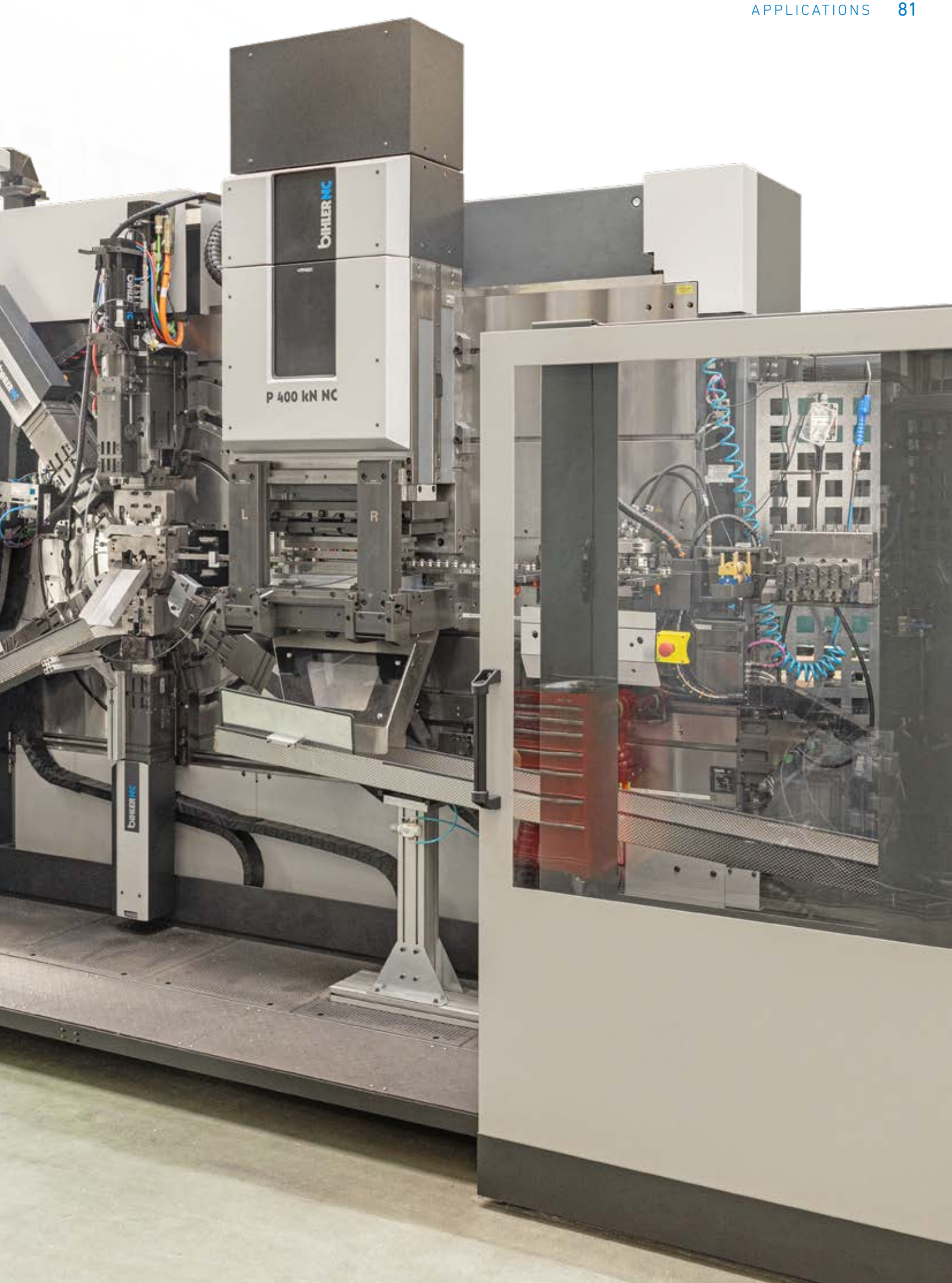
www.ewes.se

EXCEPTIONAL MANUFACTURING ACCURACY

Throughput tripled Setup times halved

With two new Bihler GRM-NC machines, Cappeller S.p.A. SB in the North Italian town of Cartigliano is setting its sights firmly on continued success and innovation. Thanks to these servo-controlled Bihler systems, this family-owned business is now able to manufacture even smaller batch sizes particularly flexibly and economically – while also halving setup times and all but trebling throughput.

Headquarters of Cappeller S.p.A. SB in Cartigliano, northern Italy


DIHLER NC
P 400 kN NC
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For Alessandro Cappeller, CEO, and Ilenia Cappeller, Head of HR, the main reason driving the investment in the two systems was the growing demand for relatively small batch sizes of approximately 100,000 parts each.

700 million parts manufactured every year, 230 metalworking machines and annual raw material throughput of 6,500 tonnes – these are the impressive key indicators boasted by Cappeller S.p.A. SB, which has its head office in Cartigliano, northeast of Vicenza in Northern Italy. The product portfolio of the company, which was founded in 1969, primarily includes springs, coils, bended wire and tubular parts as well as stamped and stamped and bended parts and complex assemblies. The company offers end-to-end, single-source solutions – from the initial customer inquiry, through prototype construction and tool design and on to production. One important area of activity is prototype construction which, on its own, occupies seven members of staff. This strategy has made the company very successful: "We have achieved continuous strong growth over the last few years," explains CEO Alessandro Cappeller. "Our company's history demonstrates our ability to constantly reinvent ourselves and focused, sustained investment in cutting-edge technologies and innovations is one of our core characteristics."

With Bihler right from the start In this context, Otto Bihler Maschinenfabrik also plays a key role for Cappeller. "The early, mechanical Bihler systems represented a completely new philosophy in the world of stamping and bending technology. These allowed us to manufacture very-high-precision components, while also achieving outstanding materials efficiency and low dimensional tolerances," explains Alessandro Cappeller. "The first Bihler system arrived at Cappeller in the early 1970s, a transaction brokered by my father Carlo Alberto," adds Efisio Carutti, Bihler's current representative in Italy. Over the decades, the Bihler system pool at Cappeller grew to reach a total of 25 machines, from the Bihler MC 42, through the RM 35 and on to the GRM 80.

A new world With its current Bihler machine pool, Cappeller has long possessed sufficient manufacturing capacity. Nevertheless, the company recently made another investment. In 2021, it acquired two Bihler B 5000 machines along with a Bihler B20 K welding system, taking its performance capabilities in the field of resistance welding to a new level. And its most recent acquisition takes the form of two Bihler GRM-NC machines. "The main reason driving the investment in the two systems was the growing demand for relatively small batch sizes of approximately 100,000 parts each. With our mechanical Bihler systems, we would never have been able to manufacture runs of this size economically due to the extremely long setup times," explains Alessandro Cappeller. "By contrast, our servo-controlled Bihler systems have opened up a whole new world for us: The setup times have been cut from ten to twelve hours down to three or four hours and throughput has doubled or even trebled. The ability to define a variable feed pitch is extremely advantageous for us."

Unproblematic tool adaptation The initial concerns regarding the adaptations that would be necessary to the existing tools also quickly proved to be unfounded: "We discovered that the tools could be adapted to the new Bihler servo-controlled systems without the slightest difficulty, quickly and at no great expense," reports Alessandro Cappeller. So far, the company has taken over approximately 35 tools to the Bihler GRM-NC systems and a further 70 will follow by 2024. However, some will be left for use on the existing mechanical Bihler systems, which are used for large runs that do not involve frequent setup operations.

Ready for use at the touch of a button At present, Cappeller is using its new Bihler GRM-NC machines to

manufacture springs for automotive brake systems. And when the next job starts, the new tool can be mounted without difficulty. “The system can be set up almost immediately at the touch of a button and is ready to resume production in practically no time at all,” explains Alessandro Cappeller. “It ensures very high-quality manufacturing that is absolutely reproducible. Even variations in the strip material can be compensated for quickly and easily.” And, last but not least, Cappeller also benefits from the fact that no additional highly-qualified personnel are needed to operate the new systems.

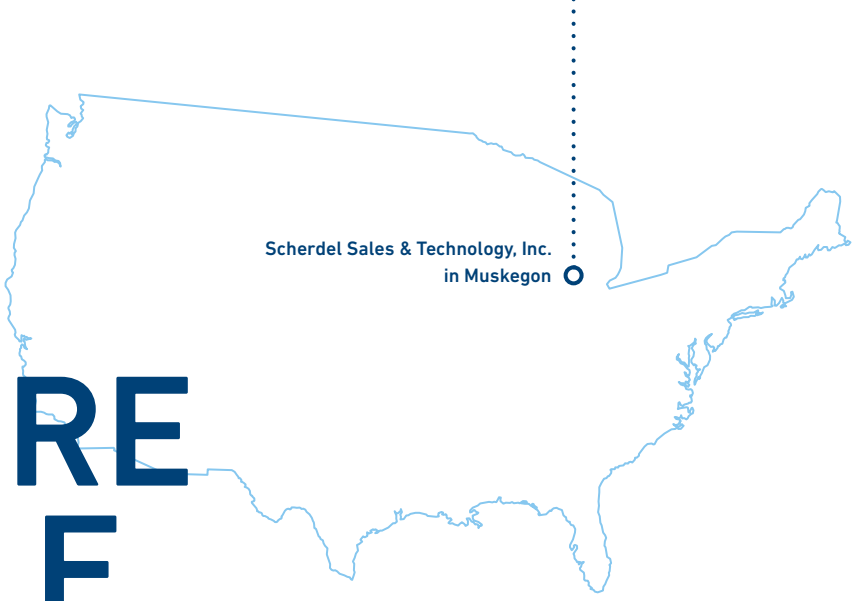
Sights set on innovation And Cappeller will continue to place its trust in Bihler technology in the future. “We are very interested in the new Bihler LM 2000-NC. As a new, high-performance linear machine, it would be very suitable for our products and open up further new possibilities for us – just like our two new Bihler GRM-NC systems have done.” ●

CAPPELLER
MORE THAN AN INDUSTRY

In 2022, the **Cappeller Futura srl** Group had a workforce of 300 employees, produced more than two billion parts and achieved sales of some 60 million euros. The Group comprises the Italian companies Cappeller SPA SB in Cartigliano, SDM srl in Manerba sul Garda, FG srl in Bellagio, as well as Mollificio Cappeller Neinsa sro in the Czech Rebublic and FG Bulgaria Eood in Bulgaria. Every year, the company invests 2.5 percent of its profits in social projects in the region, in particular in the area’s schools and kindergartens.

www.cappeller.it

FASTER AND MORE FLEXIBLE



Greatly reduced setup times Optimized for smaller runs

When it comes to producing highly-complex components for the automotive industry, the US company Scherdel Sales & Technology has been putting its trust in Bihler stamping-and-bending machines for over 20 years. To achieve greater flexibility and cut setup times, the company is now using a servo-controlled GRM-NC together with Bihler's innovative tool concept.

Since 1997, the Scherdel Group has also had a presence in Muskegon in Michigan, USA.

"Progress based on tradition," is the principle of the Scherdel Group and is also the philosophy of the US manufacturing subsidiary, Scherdel Sales & Technology, which primarily produces highly-complex stamped-and-bended parts such as tension springs, torsion springs, double-body springs, Miniflex components, stamped parts, bended parts and spiral springs for the automotive industry – always quality-conscious and always looking to the future. After initially settling in Muskegon in the state of Michigan in 1997, the company has now extended its presence to a total of four plants in North America and Mexico. To meet its customers' demanding requirements, the company works together with strong technology partners – one of which is Bihler. "To start with, we had two GRM 80 stamping-and-bending machines from our German site," recalls Sander Schoof, CEO Scherdel North America, who adds: "We overhauled the control technology of one of these in 2022 and the other one will benefit from the same treatment at the end of this year." Since the company was founded, the number of different Bihler machines used for the economical, operationally stable production of large volumes of complex parts has grown to a total of 15. In particular, the company values the high speeds and the accessibility and flexibility of tool use.

Scherdel Sales & Technology, Inc. in Muskegon, Michigan/USA was founded in 1997 and is a subsidiary of the Scherdel Group, which has its headquarters in Marktredwitz in Germany. As a mid-sized, owner-managed family company, this globally active Group has been setting standards in the metal-forming field for more than 130 years. Its core skills lie in the production of technical springs as well as vehicle parts and components for the medical market. It has slightly over 800 employees in North America, where it primarily manufactures highly-complex stamped-and-bended parts for the automotive industry.

www.scherdel.com

Focusing on the customer's needs: Thanks to the short setup times, it is even possible to manufacture smaller batch sizes efficiently on the Bihler GRM-NC.

Small volumes, short setup times "As a leading company, we follow market developments very closely. When circumstances change, you have to rethink. Growing numbers of customers now want smaller production volumes and have little sympathy for long setup times. It was becoming increasingly difficult to respond to these demands economically using our MC 120 stamping-and-bending machines for large runs, for example. That is why we wanted to optimize setup times relative to production times," explains Schoof. The solution that brought the required benefits in terms of both speed and flexibility was the servo-controlled GRM-NC. It is not only the rapid tooling times and the ease of programming but also the adaptable alignment of the NC slide units and the possibility of adding riveting stations or servo-controlled rotary stations for spiral springs that contribute so much in the way of additional value-added. Andreas Strobl, Director of Operations and Sales at Bihler of America explains: "Because it is fully equipped, the machine is set up in such a way that is very easy to activate a second or third movement from behind when required. It is also very easy to switch over from a linear to a radial tool concept. In such cases, the machine performs the changeover almost completely automatically. This provides a level of freedom that is not possible using a mechanical machine or press."

Excellent prospects for the future A first project is now being undertaken in which six different elements of a component are being produced. The experience gained from the production of the first two of these elements makes Schoof "very optimistic about the future. The standard toolholders are exceptional. Just four screws and the tool is installed." The LEANTOOL principle will increasingly be used for the remaining elements. Scherdel calls on the expertise of the Florida-based company D&C StampTec for the design of the tools. This subsidiary of vr-konstruktionen, which has its headquarters in Pfronten, Germany, has more than 30 years' experience of Bihler technologies and, as a contract manufacturer, not only extends the capacity available at Scherdel but also contributes new ideas. Strobl adds: "Collaboration with Bihler of America has also become more intense as a result of this decision. As a result, Scherdel Sales & Technology now benefits in the fields of production consulting, technical service, remote service and the procurement of spare parts, which were previously obtained from the German parent company." ●

Sander Schoof, CEO
Scherdel North America

THE NEXT GENERATION

The third version of the proven Bihler VC 1 will be available as of fall 2023. It offers many new features and functions that make manufacturing even easier, more reliable and more efficient.

Ever since it was introduced, the Bihler VC 1 controller has enjoyed outstanding success, as testified to by the wealth of production operations performed with it every day by users around the world. It is a cross-system control platform which allows users to operate a wide variety of manufacturing solutions involving a range of different process steps intuitively and reliably – on all Bihler machine types. Bihler has now extensively further developed the controller and brought out the new Version 3. "The new version of the controller offers many new features and functions that make production operations on Bihler systems easier, more reliable and more efficient," explains Senad Hodzic, Department Head Controller Development. "Our main aim was to considerably improve the ergonomic design and user-friendliness." As a result, the unit's control panel was redesigned and combined with a large, 24-inch multitouch display. With a 16:9 format, this not only permits larger views and the display of additional information but also allows multi-finger operation, for example when zooming in on a specific element. The control panel itself is equipped with an operating console comprising twelve programmable illuminated ring keys and an emergency stop button. Below this is the keyboard/touchpad, which is protected by a flap and has been designed to be even more convenient to use. Above the display, there is also a new LED signal lamp which provides a color-coded indication of the machine status and is visible from a long way off.

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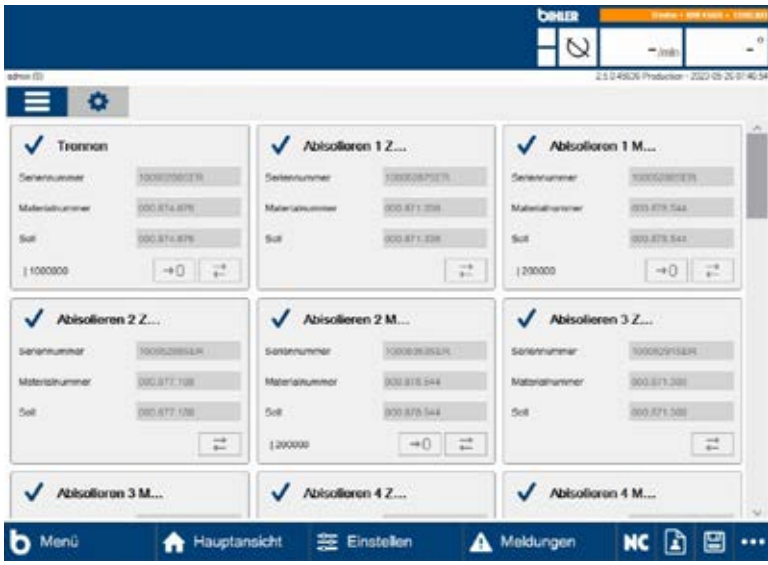
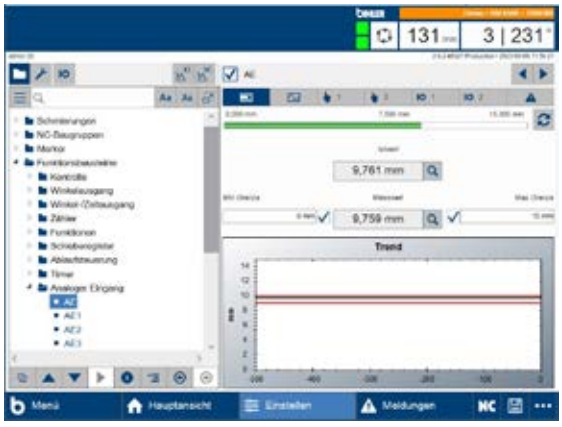
Comfort built-in Another completely new addition is access authorization via RFID PITreader on the right-hand side of the control panel. It is easy for employees to authenticate themselves as users by means of the corresponding hardware sticks and it is no longer necessary to enter a password to access the unit. This increases security, while also making access faster and simpler.
The electronic hand wheel is now integrated in the operating console and is located to the right of the keyboard together with the enabling switch. In addition, the menu guidance has also been further optimized with a new more attractive visual appearance and a more intuitive design.

Setup and tracking Another new feature of the Bihler VC 1 controller takes the form of batch tracking and setup support using a Data Matrix Code scanner (DMC). This allows operators to use a scanner to import manufacturing data into the controller. At the OPC/UA interface, it is possible to see which batch is currently being manufactured, a capability that greatly increases production traceability. The validation function is also new. Before production starts, this feature uses DMC to check whether the right tools are mounted on the system and everything is correctly configured.

The new features of the Bihler VC 1 controller include setup support as well as the possibility of transferring the measured values digitally to an external system.





All-round monitoring What is more, the latest version of the Bihler VC 1 controller is also compatible with the Bihler Digital App, which allows all users to continuously monitor, analyze and optimize their Bihler manufacturing operations. And last but not least, Version 3 of the Bihler VC 1 controller is also able to pass on analog sensor data from Production. This data is made available to external systems via the OPC-UA interface and makes process monitoring even more precise and convenient.

Version 3 of the Bihler VC 1 controller, which can be adapted for all existing VC 1 controllers, will be presented for the first time at this year's BlechExpo trade fair in Stuttgart. ●

NEW DIGITAL MODULES AVAILABLE

Otto Bihler Maschinenfabrik is continuously extending its range of digital tools and services. The latest developments are the Bihler Animation module for process animation and a new order management module. Both will be available as of the fall.

In recent years, Otto Bihler Maschinenfabrik has developed many innovative digital features and service modules for its "Bihler Digital" offering (previously Bihler Cockpit). These form a virtual environment in which all users can examine every aspect of their Bihler systems and processes and analyze and optimize these. This offering is being continuously extended and the Bihler Animation module is an example of one of the most recent developments. "Bihler Animation makes it possible to visualize and animate the entire production system as well as individual assemblies or tools," explains Bastian Hartmann from Bihler Sales and Customer Support. "Although the animations are perfect for training and induction events, they can also be used as a knowledge database." The basis for each of the animations is provided by the CAD data, which is then animated in accordance with the game engineering principle. The customer can then simply press "Play" to play through the animated manufacturing process from strip intake through to the finished product. In addition to particularly detailed views, the Bihler Animation module also allows users to define so-called points of interest. These are information fields that can be set at an assembly or tool in the form of a marker and that contain information such as settings sheets or instructions.

Job management made simple Another innovation in the world of Bihler Digital is the Bihler job management module. "Thanks to this new module, job management no longer has to be performed at the VC 1 controller and can instead be done sitting comfortably at your desk," explains Hartmann. Here it is possible to set up, edit, plan and prioritize the jobs before integrating them digitally in the production flow. The functionality of the new module has also been optimized and it has a particular user-friendly design.

Existing modules extended In addition to the two new modules, which will be available as of fall 2023, Bihler has also added new functions to the existing Bihler Digital modules. For example, archived backups can now be imported into the Offline VC 1 module and the analysis module also contains tool change times as well as the complete VC 1 message history. ●

The new module can display the entire production system or simply individual assemblies or tools.

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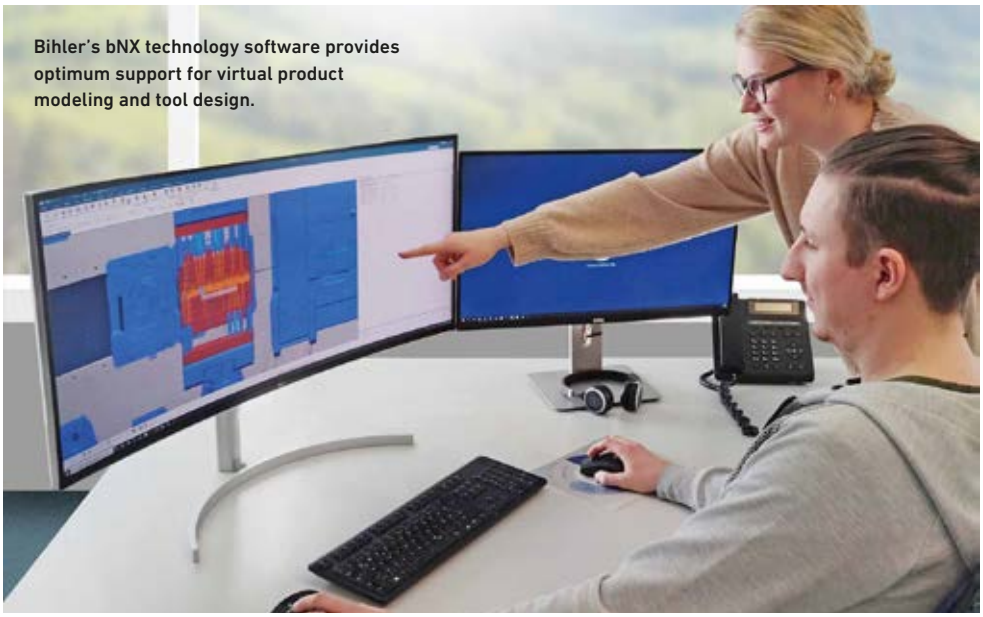
DESIGN SOFTWARE WITH NEW FEATURES



Bihler's bNX technology software provides optimum support for virtual product modeling and tool design.

New features are available with immediate effect in the Kinematics and Tool layout modules of Bihler's proven Bihler bNX 2007 design software. And as of early 2024, an entirely new version will be available in the form of Bihler bNX 2306 – for an end-to-end, digital value-added chain.

With its Bihler bNX software, Otto Bihler Maschinenfabrik offers a solution that is unique in the world of stamping-and-bending technology and that combines the strengths of Siemens NX software with Bihler's technology software. More than 200 Bihler customers already use software solutions from Bihler for their design work and are able to achieve a comprehensive, end-to-end value-added chain from the concept stage through to the finished product. All users can benefit from the new functions in the Bihler bNX 2007 software with immediate effect: "Thanks to the introduction of a new 3D forming study, the Tool layout module will make it possible to create virtual 3D plans and will optimize the arrangement of bending stages," explains Peter Bertling, Head of CAx. "In the Kinematics module, a new system configurator automatically generates parametric machine layouts for servo-controlled Bihler machines. The generated machine layout can be adapted to differing situations via the graphical user interface, thereby considerably improving productivity and quality."

Greater flexibility and ease of operation Bihler is currently working on a new version, Bihler bNX 2306, which is based on Siemens NX 2306. This version contains numerous improvements and new developments from Siemens. The focus of Bihler's developments can be found in the Kinematics module, where the engineering tools are directly linked to the operational chart. This will make the solution even easier to use and increase efficiency during project creation. A new checker will check the contents of the operational chart in order to avoid project errors and reduce development times. The new version will be available as of early 2024.

Transparent and efficient Bihler is also analyzing the potential for integrating Cloud-based solutions in order to permit real-time access to the same CAD models and Bihler applications. These solutions offer greater flexibility and scalability as well as attractive conditions. "The aim of our developments is to offer tailor-made, end-to-end, transparent software solutions that give all users an overview of their tool designs at all times and allow them to organize their processes efficiently in order to maximize value added," explains Bertling. ●

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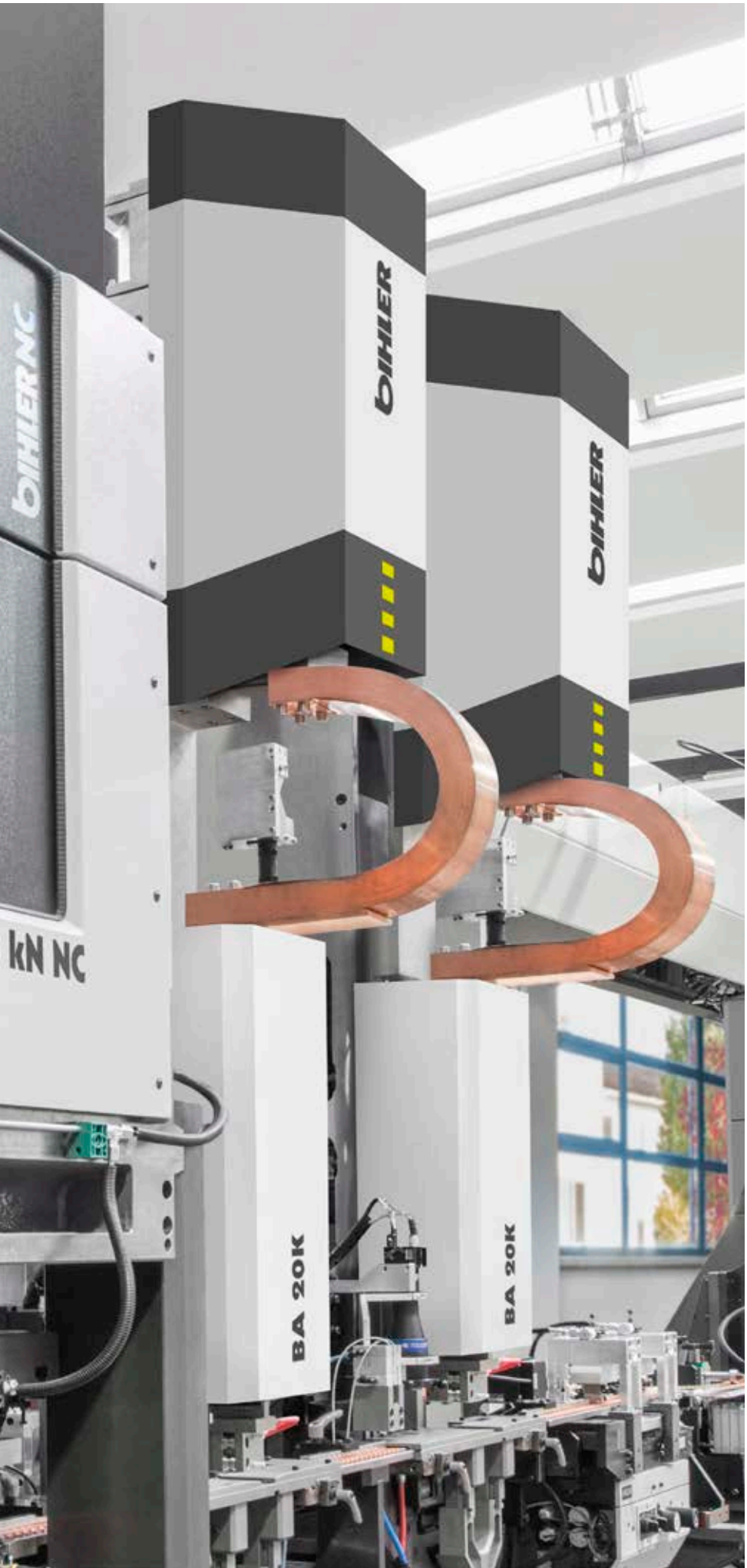


LARGE-FORMAT CONTACTS

Using optimized Bihler process technology, it is now possible to apply 10 x 10-mm contacts to copper carrier strips of up to five millimeters in thickness. They are attached using conductive resistance brazing with precisely controlled energy input to achieve components with very high dimensional stability – on strips or on finished individual parts.

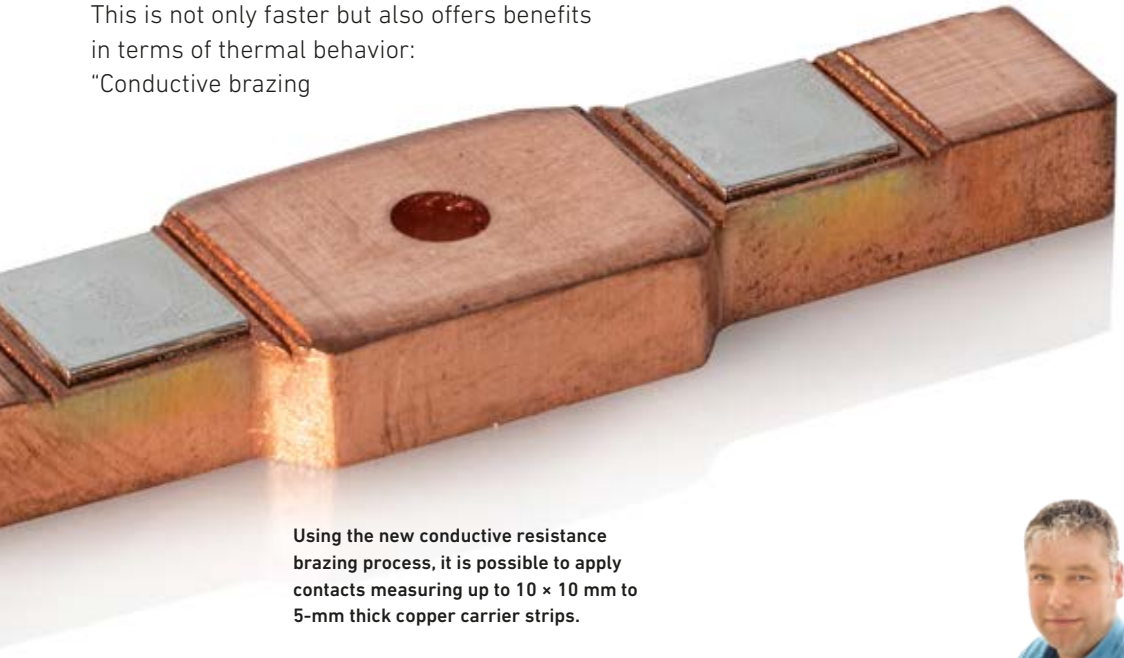
The Bihler B 20K welding controller is a key component in the new large-format resistance brazing process. It makes it possible to manufacture up to 30 welded parts per minute.

For decades, welding, and in particular resistance welding, has being one of Otto Bihler Maschinenfabrik's core competences. One important application in this field is contact welding, i.e. the application of small precious-metal round-wire, lamellar or profiled-strip contacts to strip material. In this area, Bihler has implemented thousands of welding applications that guarantee outstanding process reliability, productivity and weld quality.
In the field of contact welding, Bihler has recently witnessed an increase in demand for so-called load break switches. The contacts of these components ensure that the electricity supply is disconnected quickly and reliably should the need arise and they are installed, for example, in e-vehicles and as load switches in domestic engineering applications. Because these components are exposed to particularly high amperages, they need to be sufficiently large and the contacts are attached to the corresponding carrier strips by means of resistance brazing. In the past, however, process-related considerations meant that the thickness of the carrier strip, which is usually made from copper, was restricted to a maximum of three millimeters.

Conductive brazing Otto Bihler Maschinenfabrik has now opened up a completely new dimension in the resistance brazing of contacts: "We have optimized our existing process in a way that allows us to apply 10 x 10-mm contacts to copper carrier strips of a thickness of up to five millimeters," explains Martin Ott, Head of Welding Technology at Bihler. "This represents a huge leap forwards in resistance brazing technology and it is opening up a whole new world of production potential." The really clever thing here is that while most contacts of this sort are applied using inductive brazing, Bihler uses conductive brazing. This is not only faster but also offers benefits in terms of thermal behavior: "Conductive brazing only partially heats the component and only introduces a small amount of heat into the area of the contact," explains Ott. "This has a very positive effect on the dimensional stability of the component." The vital element in this new large-format resistance brazing process is the Bihler B 20K welding controller, whose performance capabilities have once again been enhanced for this task, in particular at the level of the inverter and transformer.

30 parts per minute In practical operation, the components are fed to the welding point and the multilayer section that is to be brazed is drawn in by the welding system and separated. The two components are positioned under the electrodes, which then close and perform the resistance brazing operation. This normally takes one second. The system then opens again and the components are stepped forward in the cycle or are removed from the welding position. In general, it is possible to manufacture up to 30 welded parts per minute in this way. The entire process can be implemented in a stand-alone unit or can be integrated in neighboring Bihler systems.

On strip material or on individual parts Another highlight is the fact that these particularly large contacts can be brazed to strip material or to finished individual parts, and this can be done without any significant impact on the prefabricated contours of these parts. It is no wonder that the process has met with considerable interest on the part of customers. If you, too, would like to take advantage of the capabilities of resistance brazing for particularly large contacts then all you have to do is ask! ●



Using the new conductive resistance brazing process, it is possible to apply contacts measuring up to 10 × 10 mm to 5-mm thick copper carrier strips.

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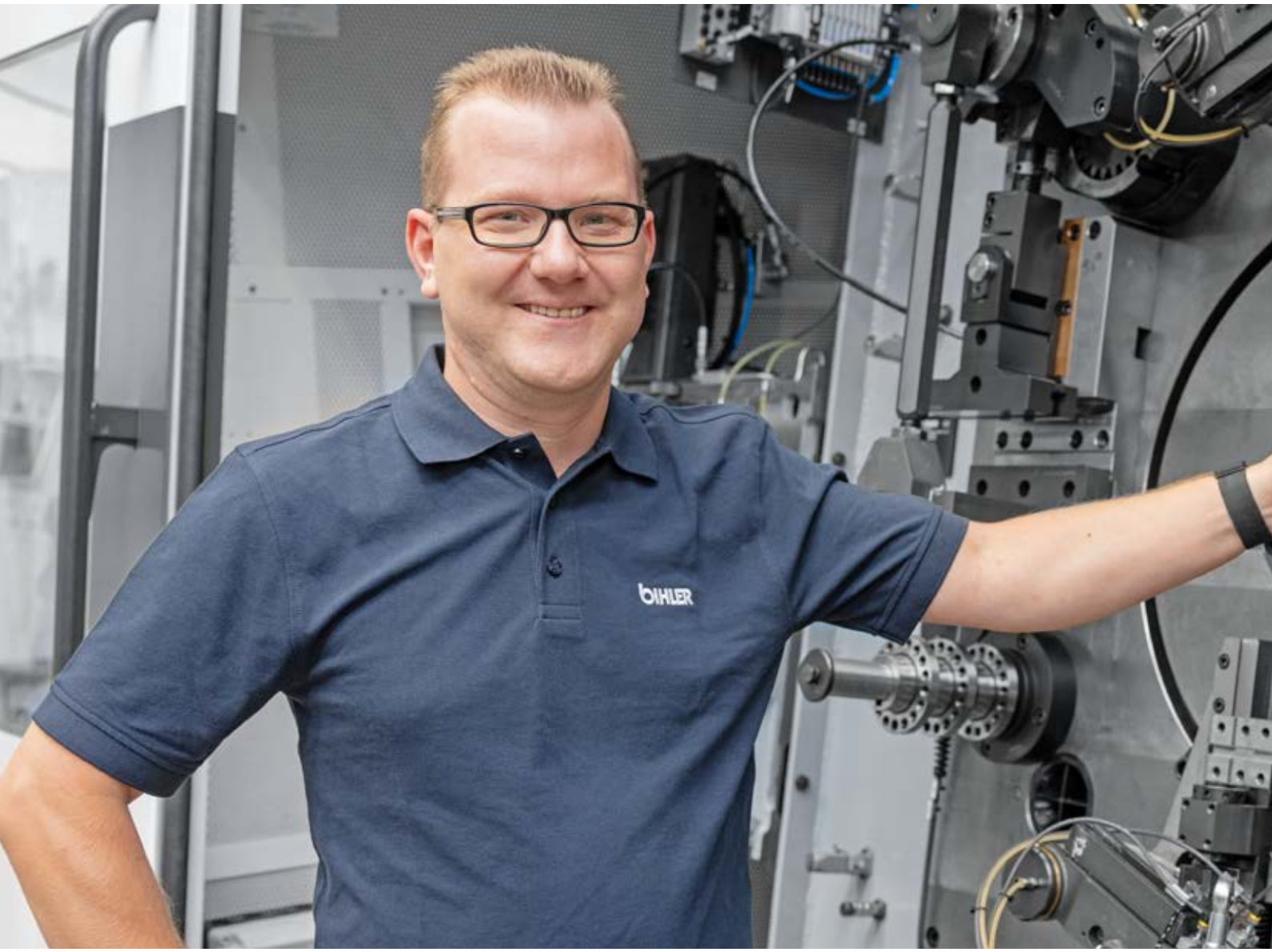
PROVEN TECHNOLOGY ACQUIRES



Whether modernization, general overhaul or extension: The aim of all these measures is to improve production reliability and increase machine availability.

Many systems from the Bihler portfolio can be upgraded to the current state-of-the-art quickly and easily. This is because Otto Bihler Maschinenfabrik undertakes the modernization, general overhauling and extension of existing systems – in a way that always meets the individual user's precise needs.

Whether in the form of a Bihler GRM-80, BZ-2 or MC 82: Earlier Bihler systems continue to play an important role in many users' everyday production operations and are highly valued because of their outstandingly robust construction, precision and dependability. However, these existing systems often come up against their limits when faced with the production challenges of the future, for example with regard to spare parts availability, handling or vertical integration. And that is precisely the problem Otto Bihler Maschinenfabrik aims to solve with its comprehensive set of modern-

NEW STRENGTHS

ization and extension measures. "We focus very clearly on making production more reliable and consequently increasing machine availability," explains Hubert Werner, who is responsible for the sale of modernization solutions at Bihler. "Following our intervention, the machines correspond to the current state-of-the-art and meet applicable safety and quality standards. Coupled with guaranteed spare parts availability, this can result in very substantial improvements in efficiency." By modernizing or extending their solutions, all users help maintain the value of their systems, and these measures also make sense in terms of sustainability and responsible resource utilization. More specifically, Bihler undertakes the modernization, general overhauling and extension of existing systems, which can then also benefit from the available digital services.

Modernizations Modernization is performed locally at the customer's premises and includes the replacement of the controller and the electrical components. No mechanical changes are made to the underlying basic machine. One example is retrofitting a Bihler BC R controller to a Bihler GRM-80 stamping-and-bending machine.

General overhauls A general overhaul includes modernization and is not performed at the customer's premises but at Otto Bihler Maschinenfabrik. Here, the system is mechanically overhauled and re-equipped right down to the last bolt and the final bearing – For example when a Bihler BZ-2 processing center is sent to be retrofitted with a new VC 1 controller. By and large, systems that have undergone a general overhaul have the same quality as a new machine and can be controlled in exactly the same way as modern Bihler systems.

Extensions Extensions primarily involve the addition of new functions and the retrofitting of machines with new mechanical and electronic assemblies. These can take the form of a new NC drive, for example, or may involve complex conversions and/or extensions to entire tools. In this way, users can perform new tasks on their Bihler systems and can extend their product portfolios.

Service from a single supplier Whatever the Bihler system in question, it is upgraded quickly and unproblematically by Bihler's service engineers. They plan their interventions individually for each system and ensure that the machine is ready for operation and recommissioned with no loss of time. "Every measure is always specially tailored to the customer's individual needs and requirements," stresses Werner. "The result is always a high performance, reliable production system with guaranteed spare parts availability that is ideally prepared for future manufacturing requirements." ●

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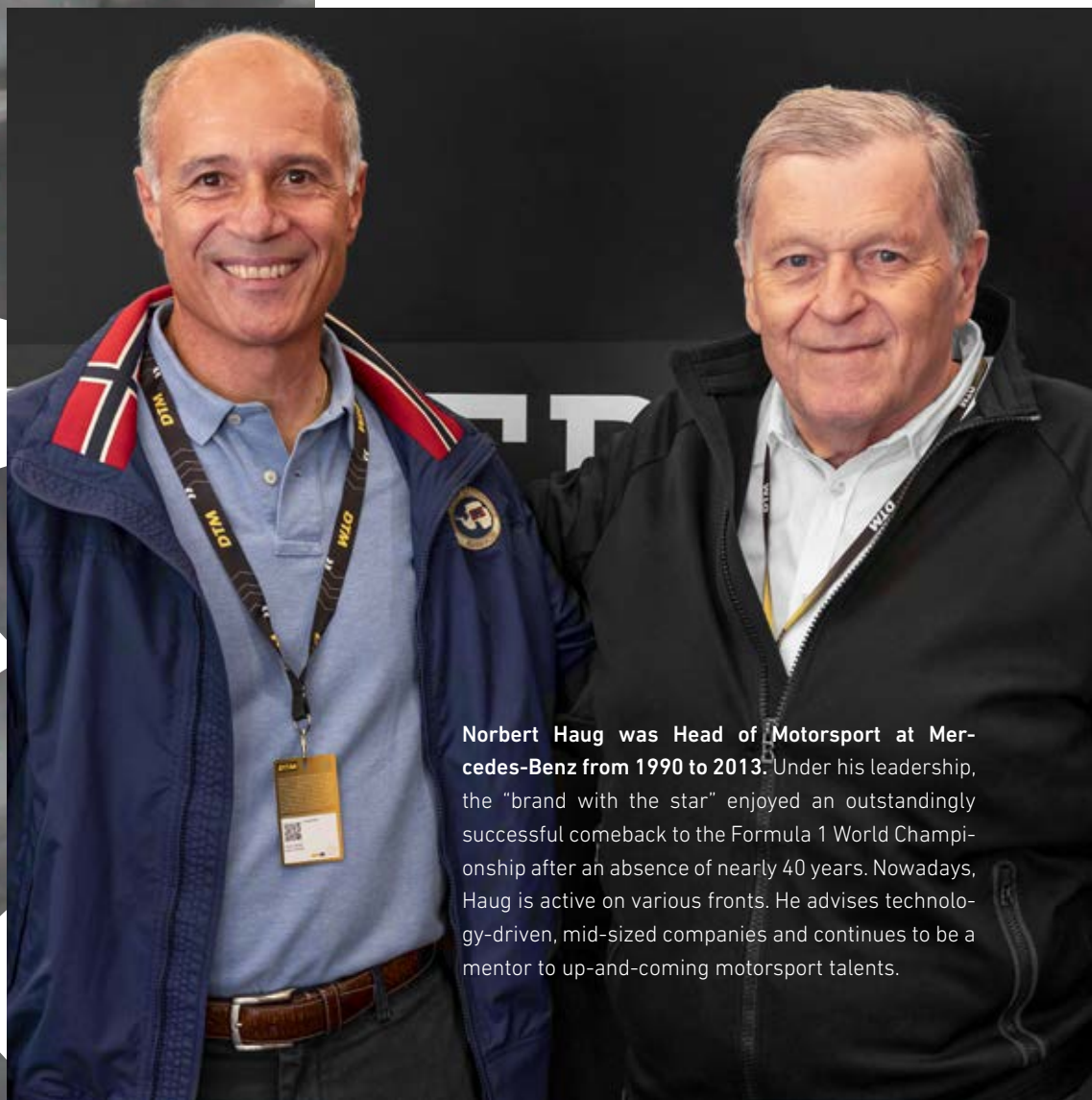
WHAT CAN WE LEARN FROM MOTOR RACING?

He is one of the defining personalities in the world of international motorsport. Norbert Haug is a journalist who changed tack to become vice-president of Mercedes' motorsport activity and who helped the "brand with the star" achieve a series of major, highly-prized successes. Many-times world champions such as Michael Schumacher, Mika Häkkinen and Lewis Hamilton are and will remain bound up with the name Haug. There is one thing that this full-blooded racing driver says he has learned through practical experience: "Peak-performance motorsport is a matter of communication. And with the positive knock-on effects that it has on the brand and the product, it makes a surprising amount of economic sense." Motorsport enthusiast Mathias Bihler spoke with Norbert Haug about how vital the human factor is for success.



Norbert Haug was Head of Motorsport at Mercedes-Benz from 1990 to 2013. Under his leadership, the "brand with the star" enjoyed an outstandingly successful comeback to the Formula 1 World Championship after an absence of nearly 40 years. Nowadays, Haug is active on various fronts. He advises technology-driven, mid-sized companies and continues to be a mentor to up-and-coming motorsport talents.

The discussion between sporting rivals: Norbert Haug and Germany's most successful Formula 1 driver, Michael Schumacher.

Mathias Bihler: We are standing in the pit lane of the legendary Nürburgring. I can distinguish between the sound of a Ferrari and a Mercedes engine without seeing them (laughs). This atmosphere at the very pinnacle of the sport is simply fascinating. You suddenly understand what all the hard work is for. What makes motor racing so exciting?

Norbert Haug: For me, motorsport demands the perfect 360-degree skill set: Motivating interactions with people, a constant stream of new technological challenges, global travel, lightning-fast reactions to unforeseen difficulties, dismaying and extremely painful disappointments when you lose, and a feeling of joy that runs through your entire body like an explosion when you achieve a major success. I consider it to be a mindset and much more than a simple competition on the racetrack. Motorsport is something that is always there. By that, I don't mean all the noise and excitement, but the whole all-embracing and extremely challenging set of tasks it imposes. It is the perfect fitness training for the mind and body and keeps you on your toes at all times.

Mathias Bihler: We haven't known one another personally for very long, but it's been long enough for me to know that alongside the motorsport manager, there is also the successful team player, Norbert Haug the person. In our own company, Bihler, whose products are, incidentally, used by many renowned names in the motor racing world, there are also people who only show their true strengths as members of the team. And then, of course, there are also those who lead. It would interest me to know whether there are differences in the way people interact with one another in our separate spheres. After all, we have the same aims: To be successful, whether in the markets or on the racetrack. What are the decisive factors?

Norbert Haug: I don't think that they are any different from in any other undertaking in which you want to get to the very top. With an indomitable will, iron discipline, and a readiness to make great sacrifices and show the immense perseverance necessary to achieve your ultimate ambition. Those are the vital prerequisites that you need in order to have any chance in the world of professional motorsport. But if you're not also an enthusiastic team player then you will fail and disappear among the masses of wannabe racing stars. At the same time, I consider each of the characteristics I just mentioned to be a vital prerequisite for being a capable manager in the business world, one who is truly able to understand and inspire his or her colleagues.

Mathias Bihler: Encouraging social skills while also acting as an example and strengthening the motivation of others – it is this triad of behaviors that we attempt to incorporate in our everyday working activities. The individual and the team – outstanding personal performance and teamwork – what has to intermesh and how, what factors influence one another?

Norbert Haug: If you want to succeed at the very top then each will interact with and inform the other in perfect harmony. This also applies to the toughest competitions at lower levels. You can have the greatest talent imaginable but that won't ultimately compensate for an inability to act as part of a team. Mutual respect and an understanding for the tasks performed by each individual are absolutely crucial factors of success. It is because these are so often lacking that so few drivers and teams are constantly and repeatedly successful at the pinnacle of the sport, Formula 1. The problem is often not a lack of money but a lack of perspective and respectful behavior, coupled with an incapacity for self-criticism. It's not the faster opponent's fault if you don't win, it's your own performance. A willingness to learn, a readiness to put up with the ordeals, the ability to get back on your feet whenever you fall, listening to and observing your colleagues and criticizing yourself from the ground up whenever you need to, learning from your betters and, above all, the driving desire that says "That's where I want to be, I must achieve that and I will," however painful it may be and however much sacrifice it may demand. The work-life balance will adjust all by itself as long as you have the right attitude.

Mathias Bihler: A family-run company also understands work-life balance to mean looking after your people very carefully if they have personal difficulties. And then helping whenever it can. The result is that the desire to achieve returns and the individual becomes part of the team again. What's it like in the world of motorsport, how can the individual contribute to success?

Norbert Haug: I think that's illustrated best of all by a Formula 1 pitstop when the team changes four wheels in

less than two seconds. If the choreography here, where everyone has to be perfectly coordinated and work with absolute precision, is not right then everything will go wrong. A team that is not at one with itself, ready for a challenge while nevertheless remaining relaxed will fail – as you can also see every now and then. The perfect pitstop is a symbol for perfect human interaction.

Mathias Bihler: The time advantage is crucial, as we also recognize when we optimize processes or harmonize different key technologies. As far as the skill sets involved are concerned: What motivated the journalist back then to move to Mercedes as head of motorsport? And: Does it help the head of motorsport to have already sat in the cockpit of a racing car?

Historic first victory of the new Silver Arrow factory team: Norbert Haug on the podium with winner Nico Rosberg and the McLaren-Mercedes drivers Jenson Button and Lewis Hamilton at the Shanghai GP on 15th April 2012.

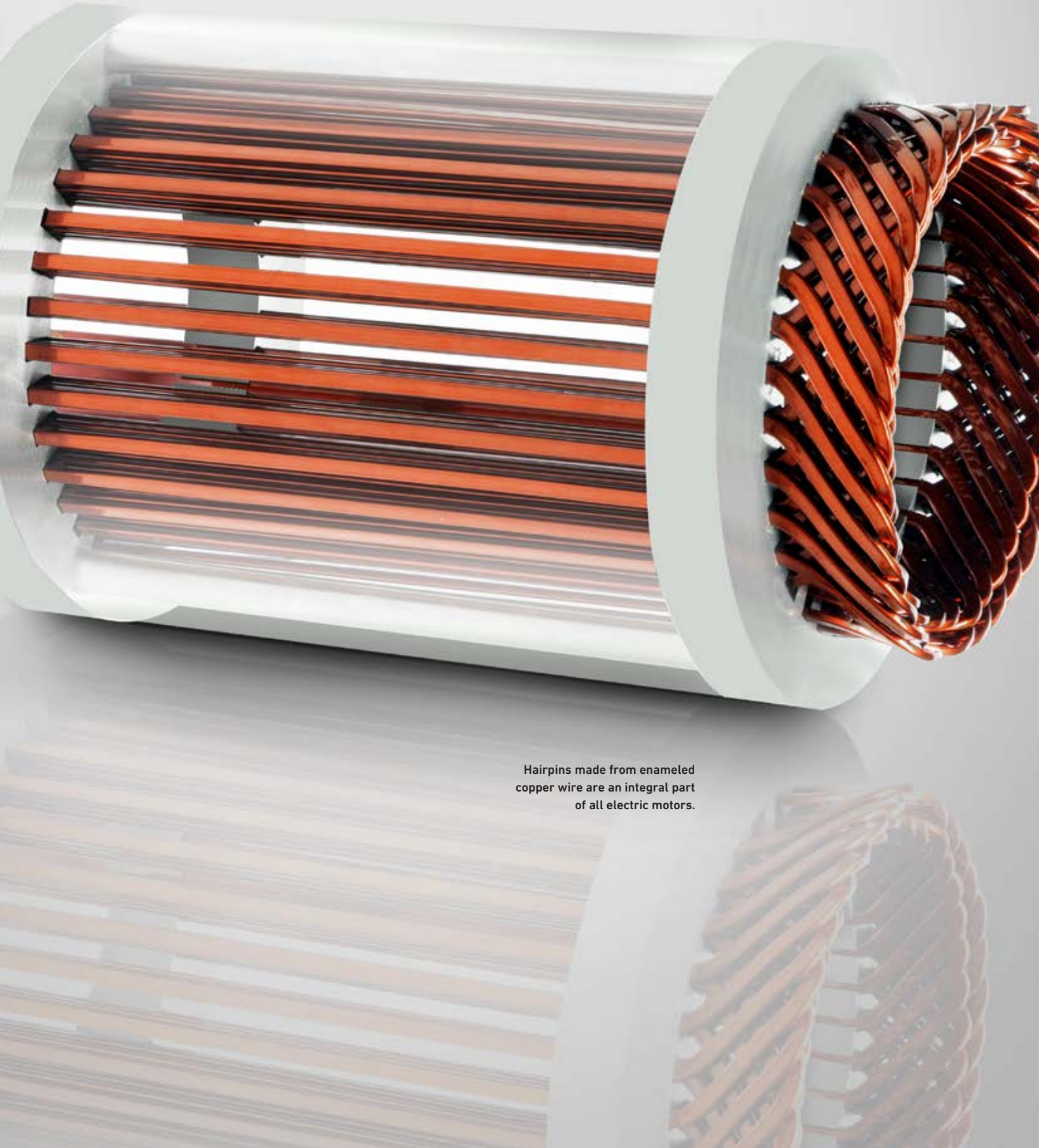
Norbert Haug: Not much really, to answer your second question. And I was certainly not a competent enough racing driver to have been given a job in my own setup! It undoubtedly helps a bit when it comes to understanding the driver's needs. The opposite effect may be a little more important, that is to say that the driver can assume that the head at least has some knowledge of the rapid interplay between steering wheel and pedals. That's something you must be able to do. Practice makes perfect. That's also true of motorsport – or as we also say: "Nothing comes from nothing". Anyone who isn't enthusiastic and self-motivated enough to go the extra mile shouldn't consider motorsport as a career because it will only cast them out again. Success can be planned, but the planning has to be right and it has to be implemented without compromise. Expensive planning and an even more expensive failure to implement it, as they do perfectly in Berlin and Brussels, won't win any laurels in the world of motorsport. As for the second part of your question: I joined Mercedes because I was invited to by Jürgen Hubbert, the board member responsible for the passenger car division, and Werner Niefer, Chairman of the Board at Mercedes-Benz. At the time, Jürgen Hubbert said "Motorsport is communication", something I couldn't really picture to myself back in 1990. Motorsport is now communication pure and simple, as is underscored by the global profile of Formula 1 on TV, on Netflix, in the stands at the race venues and in the social media channels. Looking back, the breakthrough of Mercedes-Benz in the world of motorsport was the vital turning point that helped bring this development about and Jürgen Hubbert was without doubt the moving spirit who deserves the credit for this.

Mathias Bihler: On my way through the pit lane here at the Nürburgring, I saw a lot of vehicles equipped with high-performance components manufactured on Bihler machines. Motor racing is very important for the success of the automotive industry and therefore for the well-being of us all. Why is that?

Norbert Haug: It shows that we are ready to compete. The example of Mercedes is an excellent illustration of how both image and sales figures have developed extremely positively over the last 30 years. If it weren't for motorsport, Mercedes and, in particular, its sports-focused subsidiary, AMG, wouldn't be at the forefront of the automotive world in the same way that they happily are today. Or why has Audi announced that it will be entering the Formula 1 world in 2026? Certainly not because Mercedes has set it a bad example.

Mathias Bihler: Success is infectious. We must also talk about the prospects and the future of Formula 1, the world's flagship motorsport competition, where Germany also isn't currently winning any laurels. What's going on there? Is there reason to be hopeful?

Norbert Haug: Naturally, Formula 1 towers over everything else but, as you say, no longer with Germany at the forefront as it was between 1994 and 2016 when the country won twelve drivers' championships and, what is more, a constructors' title for Mercedes. There were two Formula 1 races in Germany each year, with the stands full to bursting and 10 million viewers watching each race on the RTL television channel. Nowadays, only ten percent of this number still watch on the pay channel Sky. At each race, one German driver and number two driver keep German hopes alive. Of course, the vehement anti-car sentiment among certain circles here has not helped the cause of elite motorsport. At the same time, the car is the driver of German prosperity and the problem can't be tackled by means of bans and embargoes but by technical solutions. The attempt to impose some sort of ludicrous forced solution will ultimately always be doomed to failure. These are all very gloomy prospects and, what is more, the problems are self-inflicted. With its green, left-wing social policy, Germany is attempting to maintain its presence in the automotive world in the same way as a driver who's on the wrong side of the road and complaining that all the oncoming traffic is driving in the wrong direction. ●



Hairpins made from enameled copper wire are an integral part of all electric motors.

Intelligent isolation removal

Thanks to a new process, Otto Bihler Maschinenfabrik is making the removal of isolation from hairpins even more reliable and efficient. The solution centers around the innovative Bihler sensor unit, which continuously measures the enameled copper wire. The downstream Bihler isolation removal station then uses this data to strip the isolation from each hairpin individually and with the utmost precision – with minimum loss of cross-section and in a way that ensures pure metal surfaces.

The manufacture of hairpins has long been one of Otto Bihler Maschinenfabrik's core fields of expertise. After all, these correspondingly shaped parts made from enameled copper wire are firmly established components in electric motors and demand for them has grown greatly in recent times due to the increasing popularity of e-mobility. That is why Bihler recently developed the Bihler BM-HP servo system. This is a fully-automatic, end-to-end system that can manufactureyou up to 120 hairpins per minute and also permits "on-the-fly" variant changes. The system guarantees absolute dimensional accuracy at the level of head shape, length and parallelism of the individual pin legs and, most importantly, guarantees the reproducibility of the 3D head geometry of each pin.

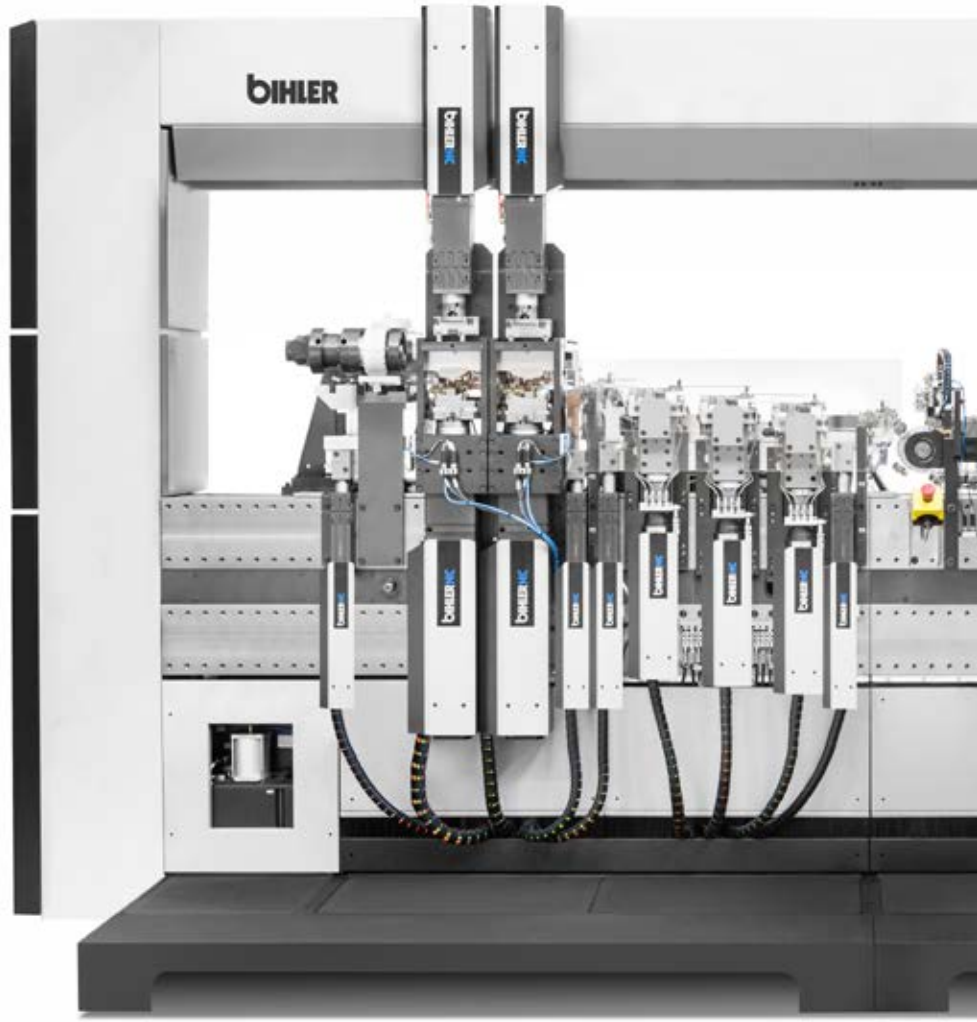
Precisely measured material removal At the same time, Bihler is concentrating on further developing its hairpin manufacturing process. One particular challenge lies in removing the isolation from the ends of the pins. "The important thing is to produce a pure metal surface at the ends of the pin legs that is completely free from any enamel residue. At the same time, the cross-section of the copper wire must only be marginally reduced by the stripping-off of the enamel coating," explains Martin

Lehmann, Bihler Key Account Manager E-Mobility. This is particularly important from a safety perspective because inadequate leg cross-sections would result in unwanted heating at the connecting points. However, it is equally vital that the coating is stripped away cleanly and without residue because the pin ends have to be completely free from contamination if they are to be welded at the stator plate following assembly.

Enormous range of materials The task of stripping the isolation from the ends of the hairpins is made more difficult by the fact that very many different enamel and coating variants may be applied to the copper body. The tolerances of the copper wire must also be taken into account. What is more, the center of the copper wire is often slightly offset in the enamel coating, which is itself not of a uniform thickness. To compensate for these tolerances and reliably obtain a pure metal surface, it is necessary to remove a corresponding amount of material – unfortunately with the exact unwanted effect of making the cross-section too small and wasting a lot of valuable material.

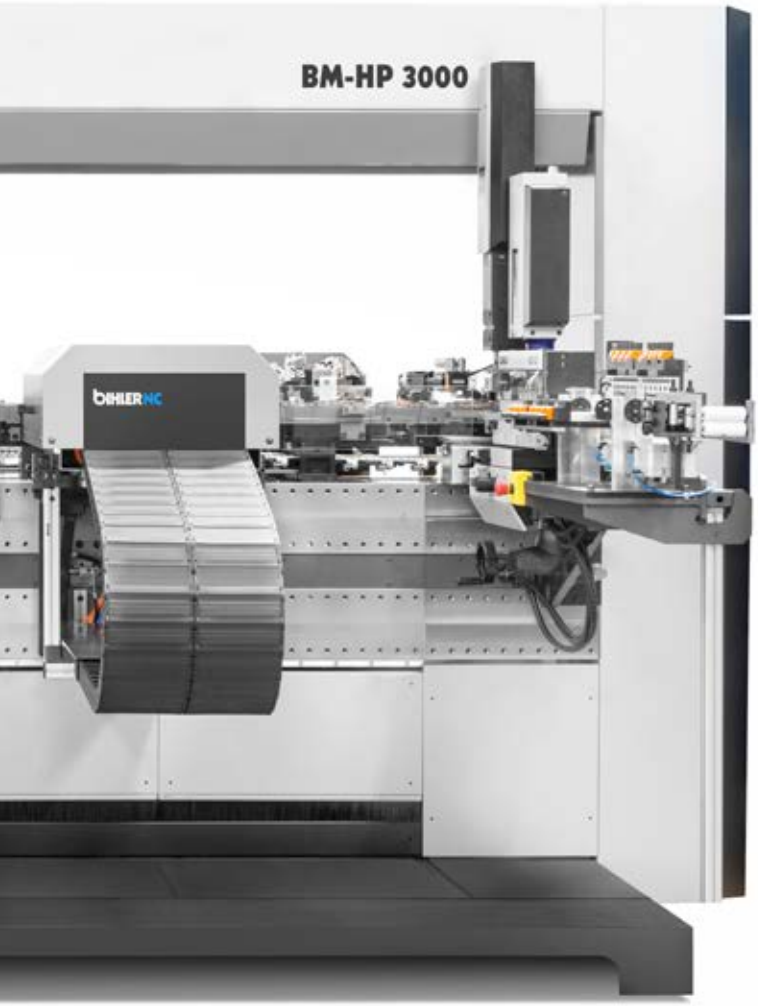
Mechanical engineering at its best This is the context in which Otto Bihler Maschinenfabrik developed the Bihler isolation removal station. This shuns the conventional laser beam-based approach and instead works purely mechanically. What is more, the enamel used to coat the surface that is to be stripped is unimportant: "We can shave off any coating," stresses Lehmann. "This allows us to produce an extremely high-quality surface while also working with the utmost precision." The isolation removal station includes a function for holding down the wire, a cutter arm and the corresponding cutter. It is located both at the front and back of the Bihler BM-HP, making it possible to strip both ends of the hairpins.

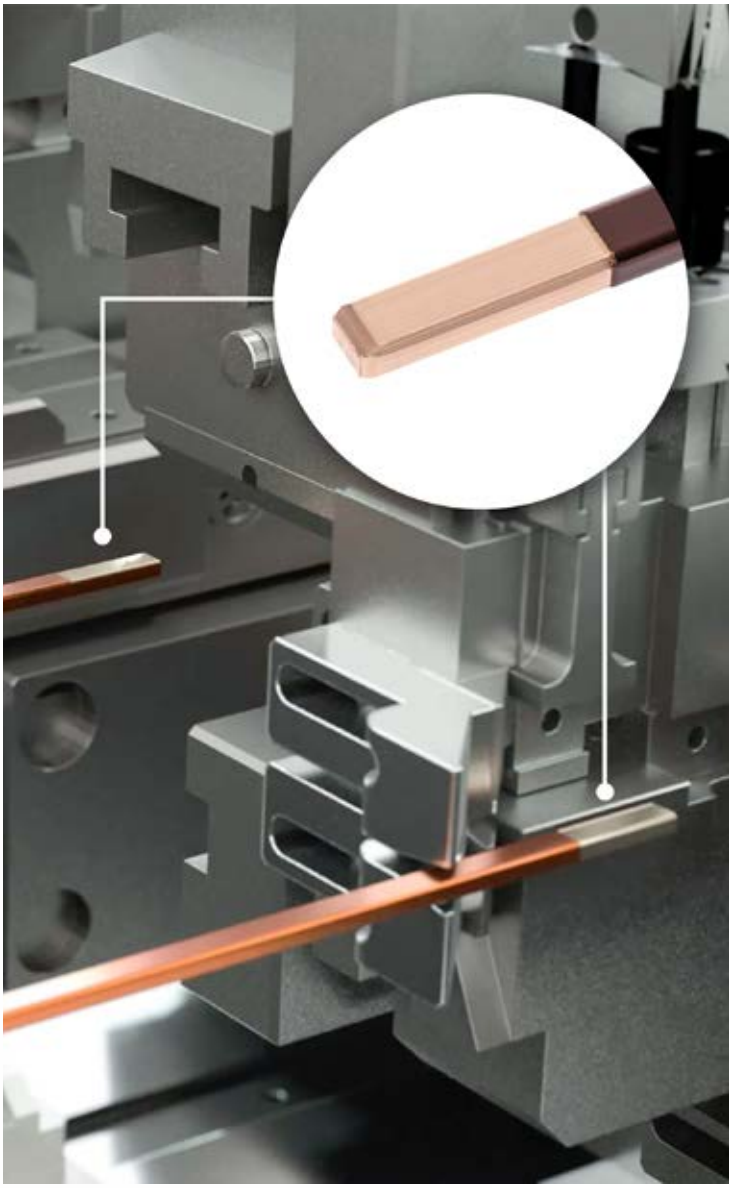
Innovative sensor technology Bihler has now also developed an innovative and completely new sensor unit. This performs continuous inline measurements of the thickness of the enamel coating and the combined thickness of the coating and the copper wire. Using this data, it is then possible to control the isolation removal station extremely precisely via a control circuit. Lehmann makes things clear: "We do not have to strip any set amount from the copper wire in order to comply with a safety margin and can instead remove exactly as much of the coating as needed in order to get down to the actual wire dimensions. This guarantees a pure metal surface with only minimum cross-sectional losses even when



the thickness tolerances fluctuate. It is an intelligent process that greatly boosts process reliability." The purity of the metal surface has been confirmed by many detailed images captured using a scanning electron microscope.

Each hairpin processed individually All the measured material values that are recorded by the sensor unit are passed on to the isolation removal station's NC motors via a so-called shift register. At the station, the isolation is stripped from each hairpin individually at a rate of up to 120 parts per minute. The solution is easily able to cope with an extremely wide variety of enamel and wire variants and the total cross-sectional loss is generally less than 0.05 millimeters. And the solution offers yet another bonus: The four-sided chamfering of the ends is also integrated in the overall process. It also ensures the residue-free separation of the front surfaces thanks to an internally developed Bihler stamping process and the use of special die geometries. The finished hairpins are then ejected from the machine and assigned to different storage locations depending on their specific type. The Bihler solution for the removal of isolation on hairpins has already been patented and is available to all customers with immediate effect. ●





The new sensor system permanently measures the thickness of the enamel coating and the combined thickness of the coating and the copper wire.

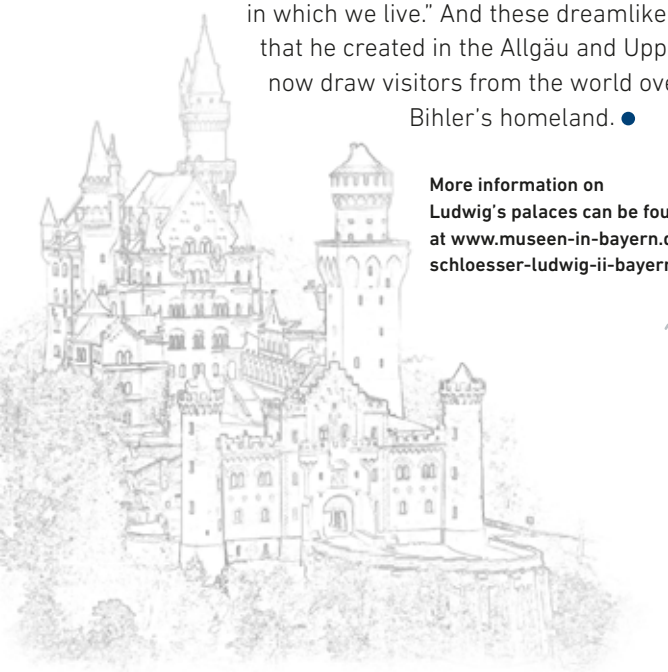
The new process for removing the isolation from hairpins is integrated in the Bihler BM-HP servo system, which can manufacture up to 120 hairpins per minute.

IN THE DREAM WORLD OF THE FAIRYTALE KING

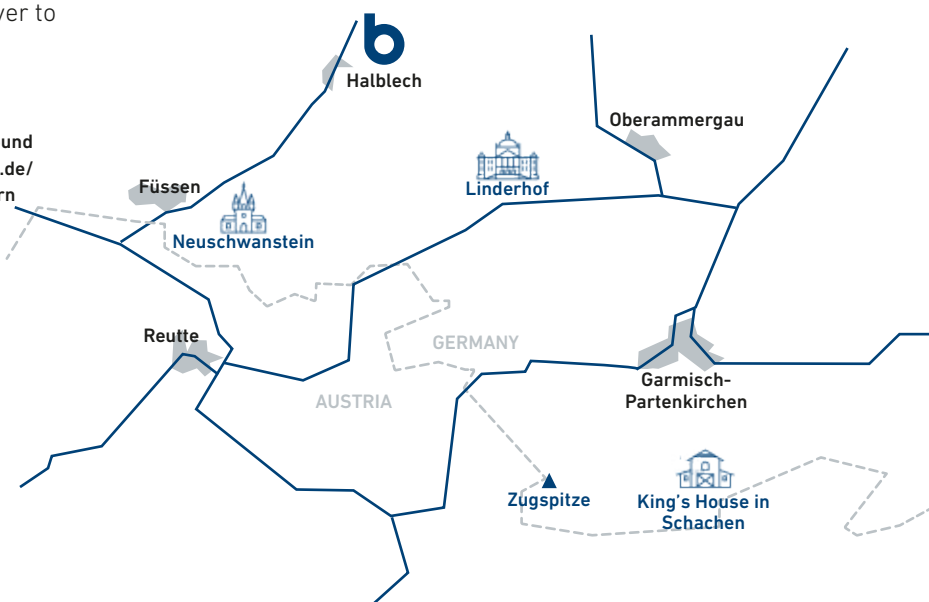
Ludwig the Second, King of Bavaria, is the symbol of Romantic Bavaria like no one else. His palaces at Neuschwanstein, Linderhof or Herrenchiemsee have given him a mythical status.

The magnificent King Ludwig the Second (1845–1886) in uniform and Coronation mantle.

Linderhof Palace on the evening of 25th August, the birthday of the Fairytale King Ludwig the Second. On this day every year, the enchanting palace park with its rococo lodges is bathed in colored light. Visitors can listen to classical music played through loudspeakers and live music performed by local brass bands and immerse themselves in the lifestyle of the solitary king. The monarch loved the night time, lights and splendor. His other magnificent buildings, such as the Palace at Neuschwanstein which, unlike his favorite retreat at Linderhof, he occupied only 172 days, testify to his vivid imagination. Even the King's House at Schachen with its view of the Zugspitze mountains hides an oriental splendor behind its simple façade. Ludwig loved life in the country and avoided Munich, his official city of residence, whenever he could: "It is necessary to create paradises, poetic places of retreat in which one can, for a while, forget the terrible times in which we live." And these dreamlike locations that he created in the Allgäu and Upper Bavaria now draw visitors from the world over to Bihler's homeland. ●



More information on Ludwig's palaces can be found at www.museen-in-bayern.de/schloesser-ludwig-ii-bayern



Linderhof Palace bathed in fairytale lights during the night of August 25th, 2023 to mark the 178th anniversary of the birth of King Ludwig the Second.

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