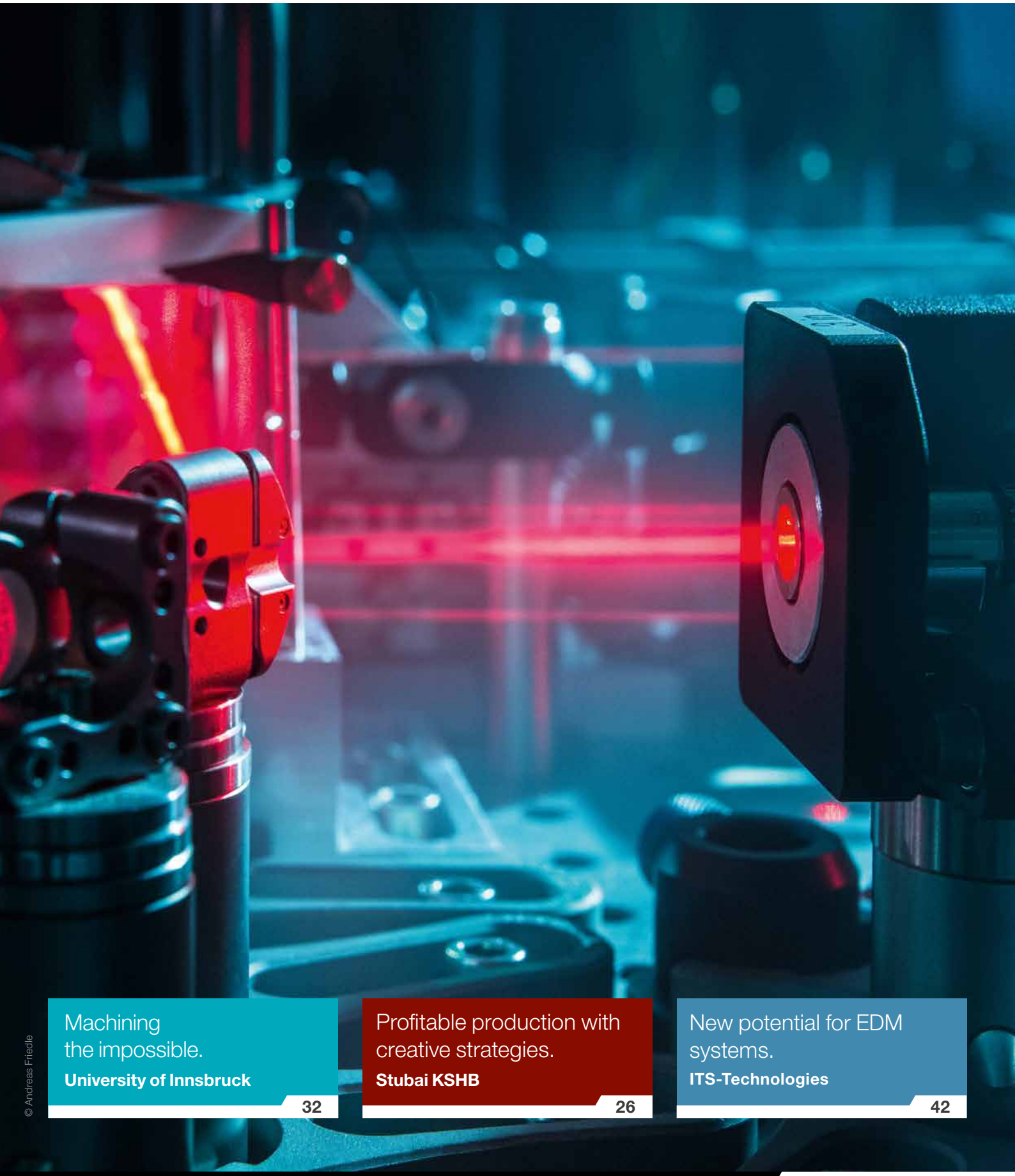
Issue **01/19**

MITSUBISHI ELECTRIC

The Art of Economy



The smart magazine for users.

Profile

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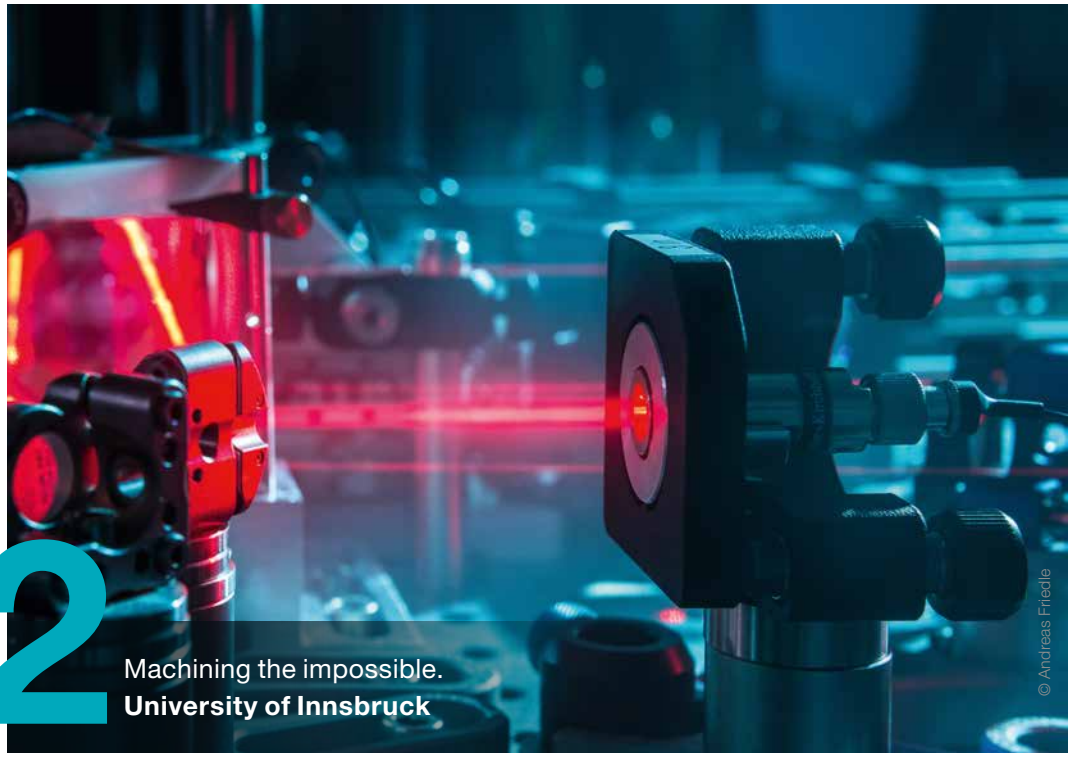

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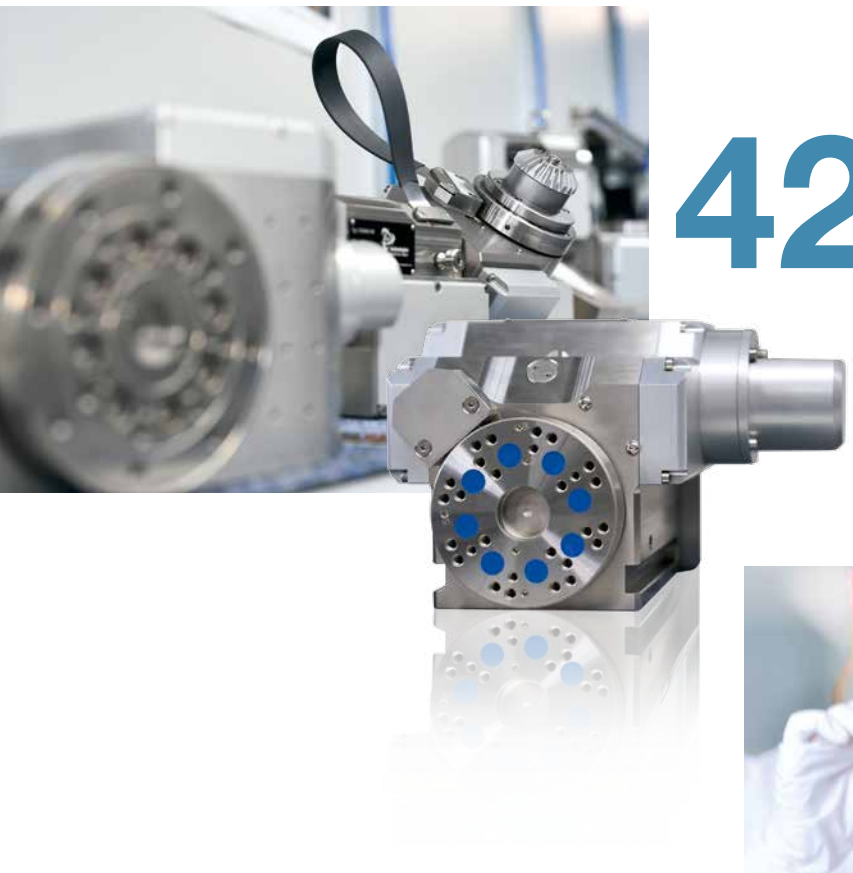
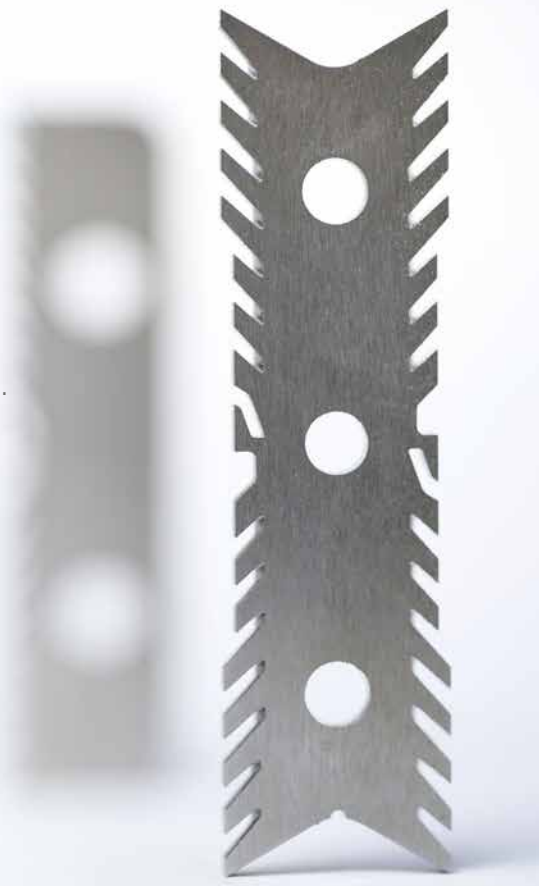


Exciting reports from the world of EDM – and Mitsubishi Electric.

User reports



Regular items

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Editorial

> "Variety without distraction would be the finest motto for teaching and life if this laudable balance could only be so easily maintained!"
>
> *Johann Wolfgang von Goethe*

Hans-Jürgen Pelzers

Exploring exciting niches ...

The University of Innsbruck has been conducting research since 1742 and its experimental physics enjoys international renown. Here we take a look behind the scenes in quantum physics – really exciting to see how tough the requirements are (from page 32).

Hackers are also known to be inventive. So sufficient precautions must be taken to protect sensitive production data. Starting on page 48, you will find out what cyber security is all about.

Optics for outer space and many other special applications can be found at Berliner Glas – who take prototype construction very seriously (from page 20).

Best regards

Hans-Jürgen Pelzers
from the Technology Centre in Ratingen

News

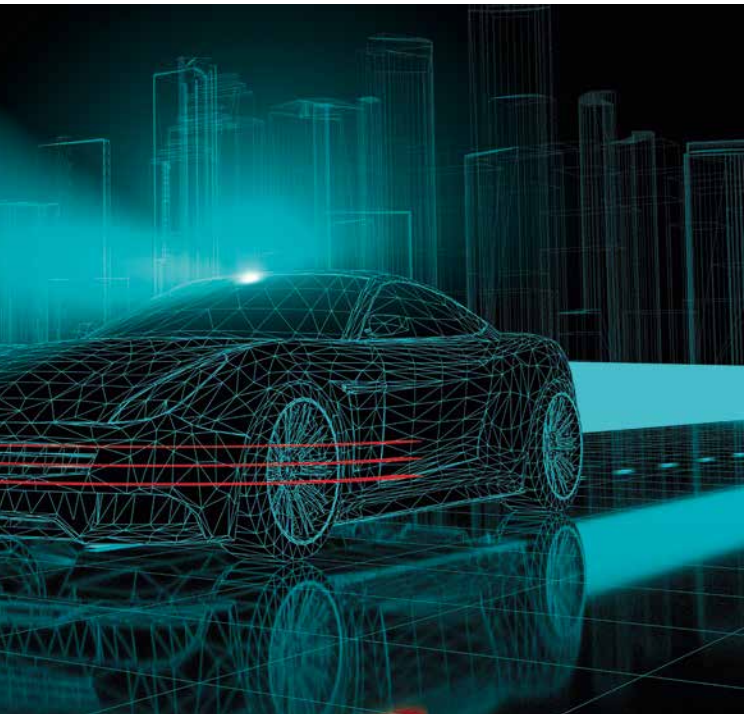
With surface radar against tsunamis

Mitsubishi Electric develops enhanced tsunami detection technology

Mitsubishi Electric Corporation announced that it has developed an high-frequency ocean surface radar technology that provides detailed measurement of tsunami sea levels, allowing more accurate and timely detection of the multiple wave-fronts of tsunamis. The technology is able to correctly detect tsunamis with an false alarm rate as low as 0.1 per cent and estimate sea levels to within 50 centimetres*, an improvement over 1 metre accuracy of conventional technology. This enables earlier and more accurate estimation of the scale of a tsunami, thereby facilitating timely evacuation and the minimisation of casualties. Going forward, the company will continue to develop the technology together with universities, aiming at commercialisation by the year 2025.

* if measurement range of the radar is below 50 kilometers. The performance depends on measurement conditions such as the state of the sea and others.

Enjoy your read of this issue!



Mitsubishi Electric develops smart, natural HMI for smart mobility

Mitsubishi Electric Corporation announced that it has developed a smart, natural human-machine interface (HMI) for cars by applying its Maisart®* proprietary compact artificial-intelligence (AI) technologies for smart mobility. After recognising the direction that the driver is facing, the technology uses Smart Notifications to alert the driver about out-of-sight-line objects. Also, the HMI's Natural Navigation system always responds to verbal inquiries in natural, two-way conversations regarding driving routes, etc. without the need for pressing a button or trigger words.

* Mitsubishi Electric's AI creates the State-of-the-ART in Technology

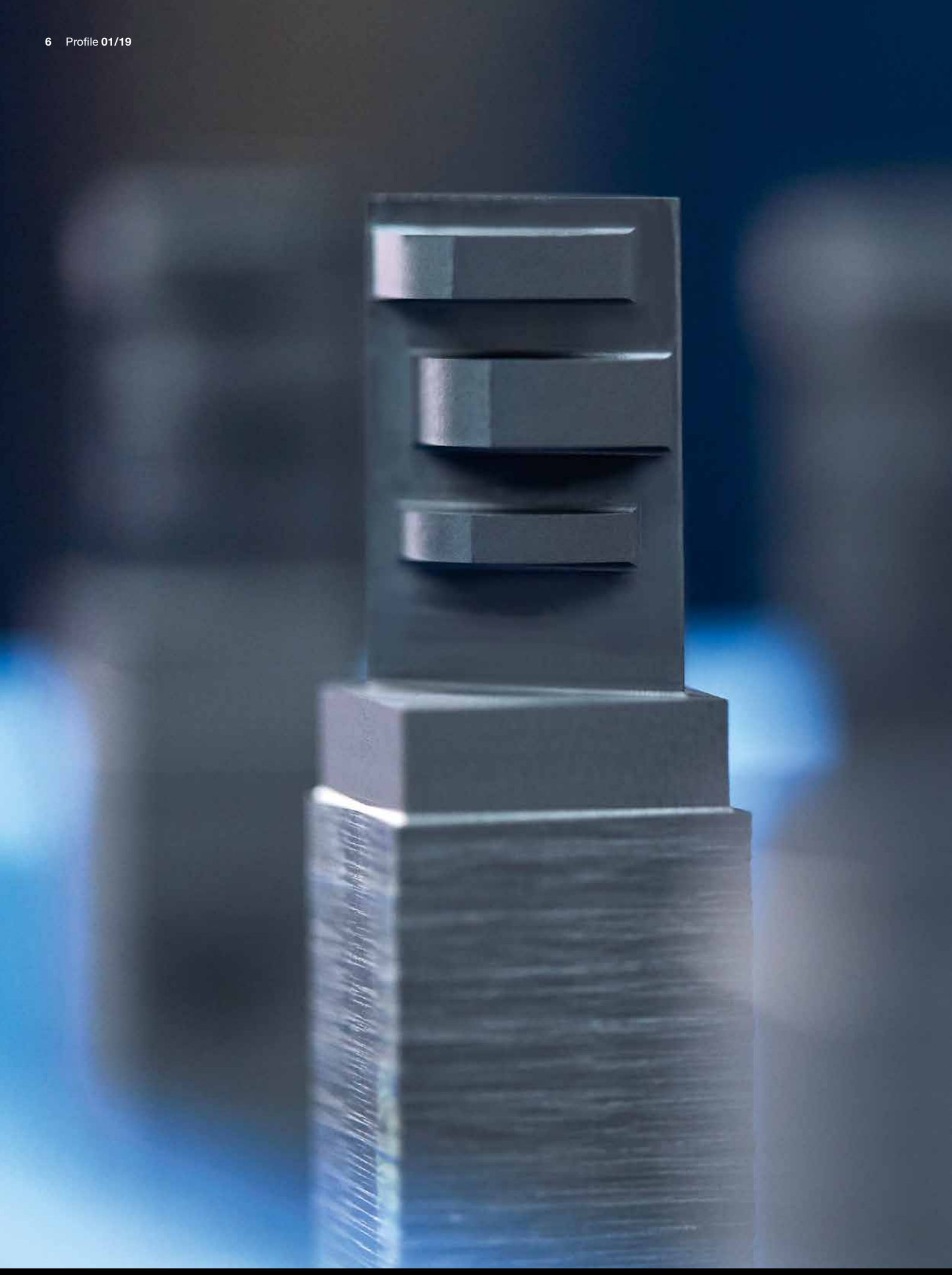
Mitsubishi Electric develops user interface and app to render spoken words instantly as 3D text in live video recordings

Mitsubishi Electric Corporation announced its newly developed SwipeTalk Air™ user interface (UI), which is believed to be the world's first UI to use augmented reality (AR) technology to render spoken words instantly as three-dimensional text during live video recordings. Text positioning is implemented by simply swiping a finger over the tablet or smartphone screen. The company also announced its development of SwipeTalk Air app on iOS® that integrates the UI, video recording and other functions for extra-expressive videos that are expected to enliven social media.

Mitsubishi Electric again nominated several times for the Environment A Lists

Mitsubishi Electric nominated for CDP's climate and water A Lists

CDP, a global-disclosure system that encourages companies and cities to manage their environmental impacts responsibly, has given Mitsubishi Electric its highest rank, the A List, in the categories of climate and water for a third consecutive year. The top rankings recognise the environmental focus of Mitsubishi Electric's business activities and goals as well as the company's timely and appropriate information disclosure.



From the idea to the finished product.

Kreyenberg GmbH

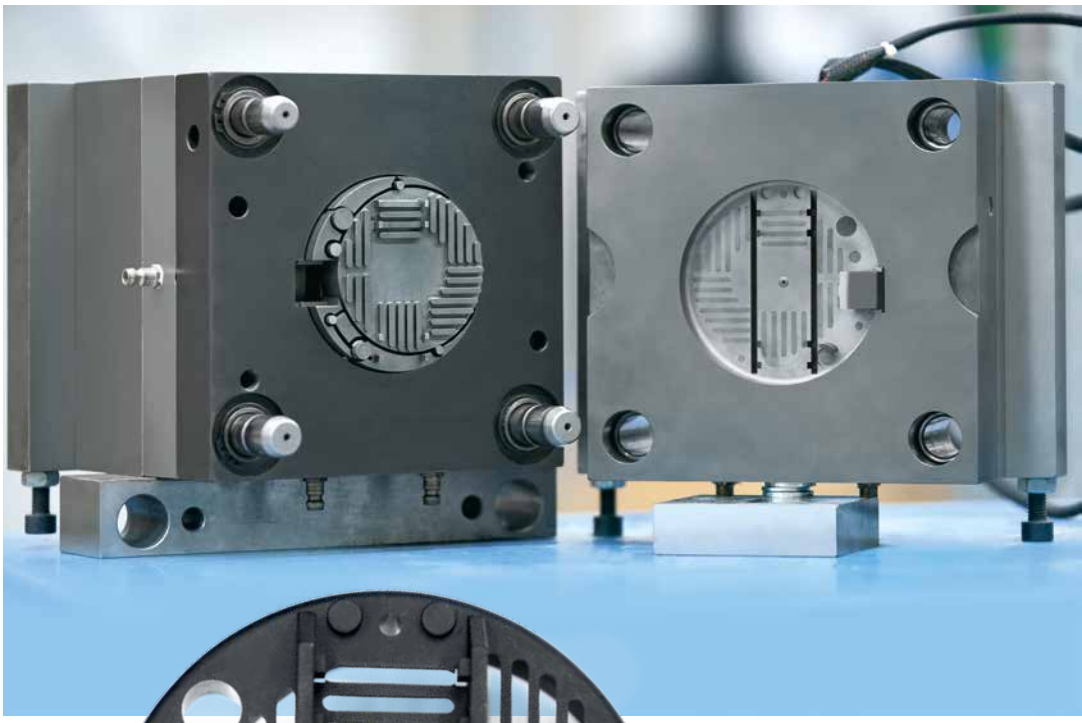
“Tradition meets modernity” –

Mitsubishi Electric EDM systems boost precision and performance.

Kreyenberg GmbH located in the north of the Hamburg metropolitan region manufactures workpieces to the highest quality and precision standards. Its main clients in the medical technology sector have extremely high expectations in this respect. In order to meet these requirements in the longer term, the company decided in 2017 to add two new EDM systems to the machine park: an MV2400R and an EA28V Advance.

Kreyenberg GmbH based in Norderstedt is a modern and at the same time traditional family business in its 4th generation. With its credo “From the idea to the finished product”, its managers Clemens Kreyenberg, his son Jöran, and Jörg Radzuweit are responsible for the fortunes of the company. The manufacturer offers a complete range of services, with a commitment to short-term and flexible delivery deadlines. Its clients come from the medical technology, machine manufacture, aerospace and lighting industries, among others. Over the years, however, the market segment of medical device technology (clamps, cutting blocks for precise scalpel guidance or implants for fixation) has come increasingly to the fore. In general, the company sees itself as a subcontractor for CNC production, component fabrication, assembly, plastics injection moulding, MIM production, toolmaking, sheet metal processing and straight turning.

Clemens Kreyenberg joined the company in 1988. In the following years, electrical discharge machining was introduced in the company. This is because the conventional machining of very complex and intricate parts with complicated contours, penetrations, the tiniest radii and special surface finishes proved to be very difficult at times. Using eroded moulds made of high-strength, high-alloy tool steel offers considerable economic advantages: low material loss, consistent product quality in the long term and rapid production cycles. The machine park was first supplemented with a die-sinking EDM system, and wire EDM was also successfully established a little later for the performance of exacting jobs.



Plastic injection mould with eroded cavities

"In general, the demanded levels of functionality, precision and quality are steadily rising. In addition, customers want to raise their productivity and are therefore constantly striving to significantly increase the output of their products in shorter production times by, among other things, increasing the number of cavities of the moulds they use. Surface finish, parallelism, contour fidelity and taper are important in this connection and call for suitable machine performance, sufficient ease of operation and great reliability. Against this background, Kreyenberg set itself the goal of offering the customer 'everything from a single source' and of remaining attractive in this sector with technical advice, feasibility testing, and prototype and sample production.

"In order to optimally meet the requirements of our customers, we have designed complete process chains in toolmaking, starting with design and CAD/CAM through to NC-aided production and quality assurance. Initialisation is located within the toolmaking department, and this is where experienced engineers, NC programmers, and skilled workers such as machining technicians, EDM specialists and mould makers share the more complex tasks and also make use of appropriate CNC machining centres and EDM systems," says Clemens Kreyenberg. In the last quarter of 2016, taking stock of the situation, the management decided to invest in a wire EDM and a die-sinking EDM machine of the latest technology. In the field of wire erosion, the aim was to facilitate the machining of larger workpieces and the multiple clamping of smaller parts. In the die-sinking EDM sector, there was a desire for a larger workspace for the manufacture of injection moulds. In addition, the goal was to improve the surface quality of the workpieces and significantly reduce electrode wear.

After extensive market research, the decision went again in favour of Mitsubishi Electric – but not without a thorough test of the performance of the machines in question in Ratingen. "The fact that we have been using

Mitsubishi Electric eroding systems for quite some time now is attributable to our highly positive experience in terms of precision, performance and reliability coupled with simple operation and low maintenance," adds Jöran Kreyenberg.

Easy integration into the operational workflow

The MV2400R wire cutter and the EA28V Advance die sinker were installed in the spring of 2017. After just two days, the machines were fully integrated in the operational workflow. Machining speeds are up to 30 per cent higher than on the predecessor machines. The basic course to learn how to effectively operate these systems took just under a week at the Mitsubishi Electric training centre in Ratingen. In addition, professional handling is promoted by the further-improved intuitive user interface, the acquisition of practical experience, consultation with the hotline and, if necessary, the attendance of the requisite workshops.

With its precision, innovative technologies, throughput and energy efficiency, the new MV2400R wire EDM system has replaced the two previous FA20-S Advance machines also from Mitsubishi Electric. One of the predecessor machines has been sold and the remaining one will be used for workpieces that have been standard jobs for years. It will also be on hand if its performance meets the precision requirements of the job in question.

"We mainly use 0.25 mm brass wires. Downtime due to wire breakage is now a thing of the past," reports Cathérine Knobloch, who has been in charge of EDM at Kreyenberg since mid-2016. "In addition to the various technical features of the MV2400R, automatic wire threading is very important to us. This has proven particularly advantageous for high and interrupted workpieces. If at the end of the day shift, it becomes apparent that suitable machining makes sense because of delays or so that we can provide our 48-hour service, unmanned shifts can be implemented overnight or over the weekend."

"We can cut 15° tapers as standard, but we also wanted to improve machine performance here. With Angle Master II we are now able to produce 45° tapers. We also appreciate the Corehold technology," Jöran Kreyenberg explains. If several drop-out parts are produced, they can be secured with retaining bridges during machining. In this way, for example, many penetrations can be pre-roughed, and the drop-out parts can be removed in a single operation and then re-cut. With the MV2400R, such production steps can also be carried out as 'long runners' overnight

The quality of the die-sinking and wire-cut EDM processes is decisive for the final result

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www.mitsubishi-edm.de/kreyenberg-en

or over the weekend without manual intervention. “The achievable advantages, and especially the reduction in machine running time, became obvious with an order lasting more than a month for the production of workpieces with almost 200 drop-outs,” Knobloch adds.

The intuitive operation of the new wire EDM machine is very convenient with various input masks, symbols and assistance. Workpiece setup is supported by 3D views on the machine’s touchscreen. Furthermore, the wire’s angle of inclination is automatically compensated for and adapted to the exact workpiece position by measuring the workpiece surface using a measuring probe.

A first interim analysis showed a reduction in machining time, in operating resources such as erosion wire, deionising resin and filter cartridges, and in energy consumption.

Die sinking EDM features low-wear graphite electrodes, a 20-fold electrode changer and simultaneous machining

“After taking something of a backseat for a long time, die-sinking EDM is now a key process in our toolmaking activities. In principle we only use graphite electrodes. This is because they can be produced very precisely in relatively short cycle times and are extremely low-wear. These are manufactured on a 5-axis HSC milling machine specially tooled for the production of these graphite electrodes,” reports Clemens Kreyenberg. “The EA28V die sinker equipped with the latest technology provides us not only with a sufficient array of functions but also with considerable performance with the meeting of economic, ergonomic and environmental requirements. “For example, in the machining of a workpiece that Kreyenberg has been producing for years for one of its customers, they have significantly reduced machining time. They used to start machining on Friday afternoon and completed the job on Monday afternoon. Today, by comparison, the workpiece is ready on Sunday morning – admittedly, the older machine came from the generation at the turn of the millennium.

The eroding machines are capable of operating amid conventional machine tools without any problems.

If, for example, unmanned machining does not take a whole night, the machine switches all standby systems to ‘sleep mode’ on completion. This process reduces the energy consumption already optimised due to the new generator technology.

Simple dialogue-guided programming

Highly convenient and intuitive operation.

The fact that we have been using Mitsubishi Electric eroding systems for quite some time now is attributable to our highly positive experience in terms of precision, performance and reliability coupled with simple operation and low maintenance.

Jöran Kreyenberg,
Managing Director of Kreyenberg GmbH

The purpose of the 20-fold electrode changer is to boost the productivity and flexibility of the machining sequences on the machine. A fine-finishing generator is also available.The high-precision C axis supplied as standard ensuresthat CNC-integrated simultaneous machining and highly precise electrode positioning are possible.

The Job Planner software developed by Mitsubishi Electric enables fast and flexible work planning both directly on the MV2400R and on the EA28V die-sinking system. This integrated and customisable job planning is capable of efficiently managing multiple machining programs or jobs – without requiring programming skills from operators. New jobs can be added during the machining process. By simply assigning priorities, it is possible to react to changing requirements in the machining sequence, e.g. due to an urgent order. If necessary, an ongoing machining process can be interrupted and the current status is automatically saved. This is immediately available for the resumption of machining on completion of an inserted job or intervention. If necessary, configurable machining parameters can be used to provide clear-cut information on the status and production times of machining operations, on the consumption of operating resources and on maintenance requirements.

Should malfunctions occur, messages to this effect are immediately shown on the display. An additional window provides the operator with a problem analysis as well as instructions on remedial measures. Even complicated machining steps can be controlled in 3D. With mcAnywhere Contact and Control as purchased optional extras, standardised short messages are automatically sent to freely definable mobile phone numbers in the event of malfunction. On the other hand, ‘Control’ enables remote access to the machine via iPad or laptop for the convenient monitoring of critical machining

Proper set-up as a basic requirement for immaculate results

The company

Kreyenberg GmbH from Norderstedt can look back on more than sixty years of company history. Despite the difficult circumstances in the post-war period, the Riga-born German engineer Artur Klemens Kreyenberg succeeded in 1952 in founding a one-man business providing a service for Leica cameras and Leitz microscopes. The business subsequently evolved into a subcontracting company, which was taken over by his son Klaus at the beginning of the 70s. He concentrated the business on professional photography with the company’s own products, such as special projectors. With the advent of electronic image processing in the 80s, the company reorganised itself into a classic CNC subcontractor concentrating on toolmaking and plastics injection moulding. Today the production departments have at their disposal a machine park of 80 CNC machine tools including multi-axis machining centres as well as various conventional machine tools on 8,000 m². With its core competence in medical technology, machine manufacture and aerospace, the company has made a name for itself far beyond the northern German region. Its certification to DIN EN ISO 13485 attests to its high quality and creates confidence. The commitment and expertise of its 215 employees, including 30 trainees, contribute greatly to this.

operations and contact with a Mitsubishi Electric technician for assistance.

“For the new wire-cutting and die-sinking machines, we have witnessed a remarkable improvement in precision, quality and performance in terms of high reliability and a noticeable reduction in the cost of materials and operation. In short, our expectations have been fully met,” says Clemens Kreyenberg summing up. “The response from our customers has endorsed our decision, and we can look forward to future challenges with great functional diversity and flexibility”.

Left to right: Cathérine Knobloch, Jöran Kreyenberg and Clemens Kreyenberg

The EA28V die sinker equipped with the latest technology provides us not only with a sufficient array of functions but also with considerable performance with the meeting of economic, ergonomic and environmental requirements.

Clemens Kreyenberg,
Managing Director of Kreyenberg GmbH

Kreyenberg GmbH

Founding year
1952

Managers
Clemens Kreyenberg,
Jöran Kreyenberg,
Jörg Radzuweit

Employees
215

Core business
Plastics processing and precision toolmaking

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Accurately and efficiently produced moulds.

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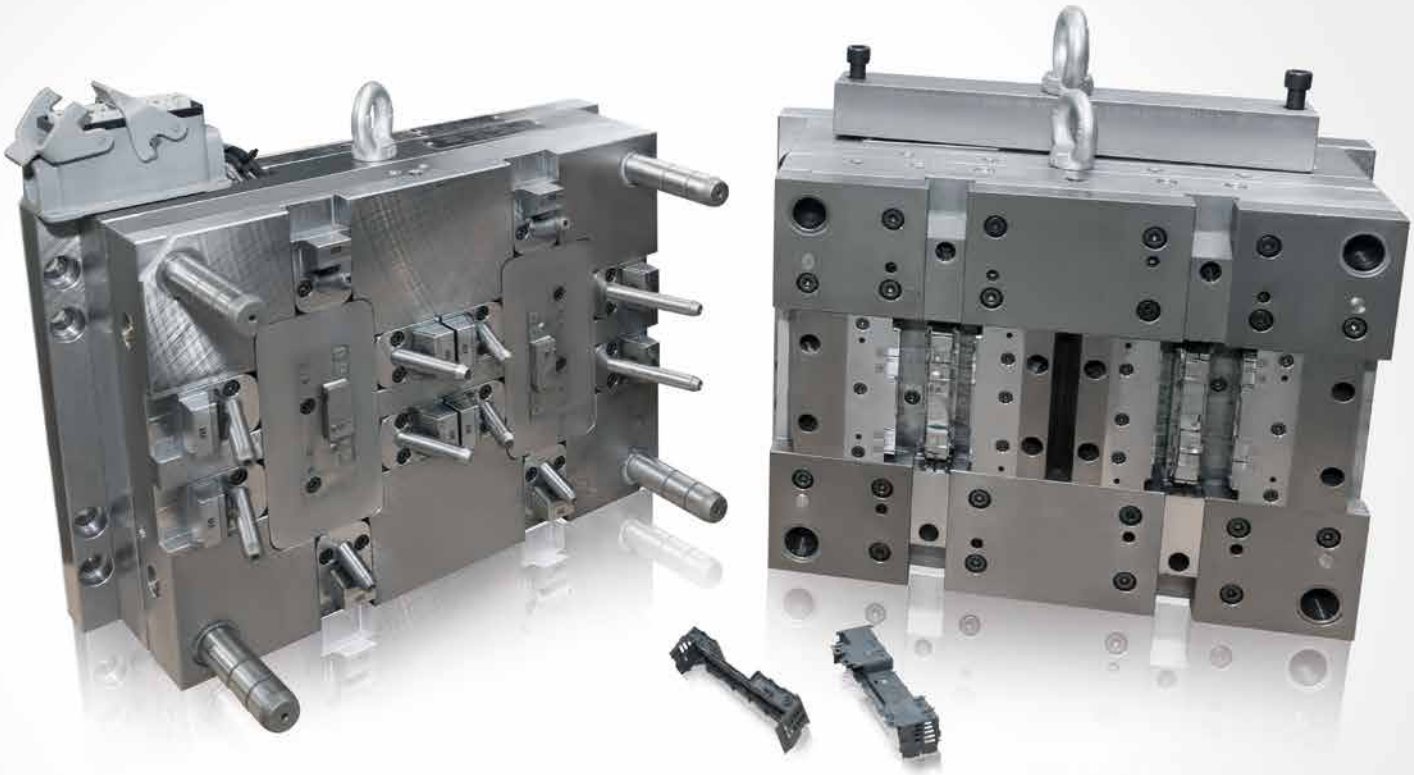
Problem solvers
from the world of plastics.

At GBM Kunststofftechnik und Formenbau GmbH, moulds not only have to be produced with precision, but also efficiently, and the parts also have to satisfy aesthetic requirements. With a new MV2400R they are succeeding magnificently.

With an elemental force of up to 2,500 bar, the injection moulding compound is pressed into the mould. This is repeated every 20 seconds and a new plastic part sees the light of day. “These are connectors for vehicles,” says Roland Barth, speaking above the noise in the production shop. The managing director of GBM Kunststofftechnik is noticeably satisfied, and he also gives the reason: “The mould has minimal play and a gap of only a few micrometres; its shaping elements are made of high-alloyed tool steels such as 1.2343ESU and 1.2712 (hardened to 54HRC), while the mould base consists of unalloyed tool steels or higher-grade nitriding steels such as 1.2738.

A total of 35 injection moulding machines can be found in the halls of GBM, which is located in the small Austrian town of Mattighofen near Salzburg. Be it parts for cars, medical devices or telecommunications equipment – there is very little that GBM cannot mould in plastic. Customers know that too, and word gets around. It almost sounds a bit arrogant, but the fact is: “We don’t do classical marketing as it’s never worked for us,” says Barth. No newsletters, no post-mailings and no other campaigns to attract business. “New customers come because we solve the problems of existing customers and do our job well,” says Barth.

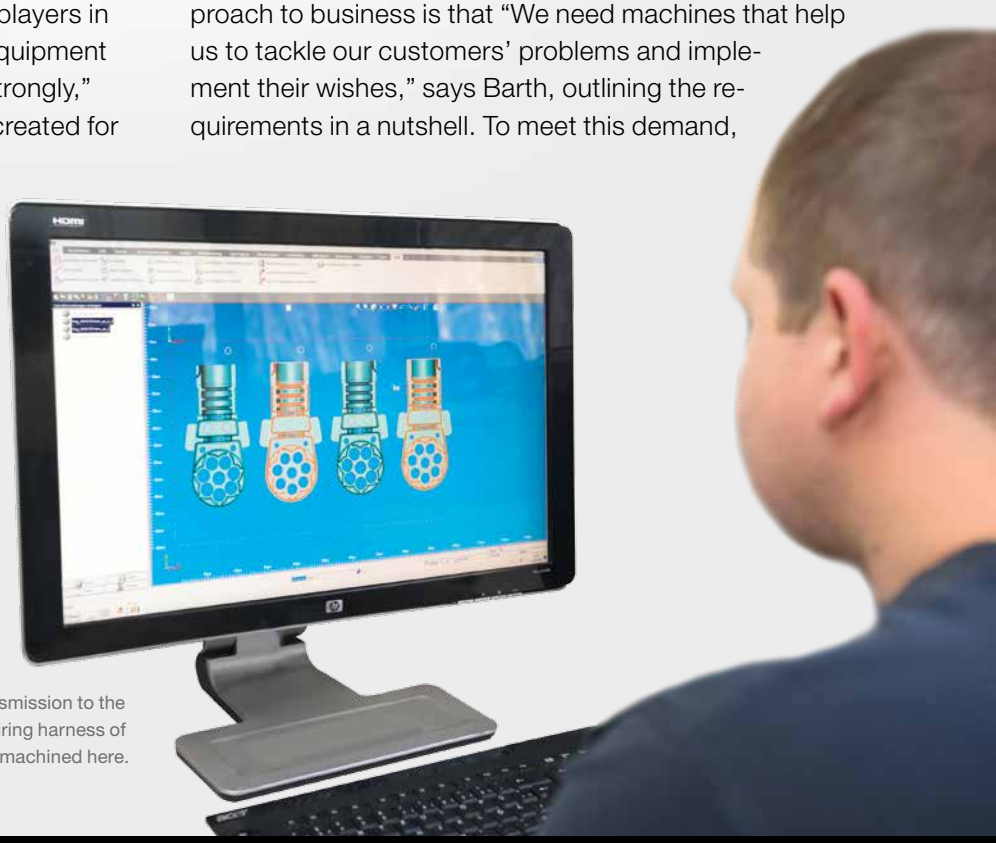


An injection mould for components of an industrial control system with two cavities and heated melt guidance system. The movable elements form a tight seal in their end positions.

In this way, one thing leads to another, or to be more precise, one customer to another. In this way, GBM has acquired an abundance of references. Car companies are just as much among them as are major players in the electronics industry. “Vehicle charging equipment is an area that is currently developing very strongly,” says Barth. Extremely complex shapes are created for this – to produce wall boxes, for example, the compact e-charging stations for the house wall.

From a garage business to an international player

It all started in the proverbial garage. This stood alongside the house of the founders Georg and Wilma Barth, the parents of today’s managing director. A shed was used as a store-room back then. Today, GBM occupies a total of seven large halls – and is no longer just a Tier 2 or 3 supplier of injection mouldings and/or subassemblies, but a problem solver with decades of experience. The consequence of this approach to business is that “We need machines that help us to tackle our customers’ problems and implement their wishes,” says Barth, outlining the requirements in a nutshell. To meet this demand,



CAD-CAM preparation of the cutting programs for transmission to the MV2400R. The inserts of a mould for connectors on the wiring harness of an electric vehicle are machined here.

> *We have a very broad customer portfolio for which we need highly complex moulds and in some cases develop special solutions. We've got a broad set-up.*
>
> *Roland Barth,*
> *Managing Director of GBM Kunststofftechnik und Formenbau GmbH*

GBM recently purchased an MV2400R Connect from Mitsubishi Electric. "We had already gained a very good impression in preliminary talks," says Barth looking back. A competing machine was also up for selection. The decisive factor was discussions with tool- and mouldmakers in the area. "Colleagues in the industry had nothing but positive words for Mitsubishi Electric, without exception," says Barth. Added to this was the good reputation of the global player from Japan with more than 30 years of experience in the EDM sector.

The machine has been in operation for a year now, and the very good first impression has been endorsed, says Barth. At GBM, the EDM system is used almost exclusively for producing moulds for injection mouldings. "We use the machine for longer than a typical jobshop. It was therefore important to us that the technology does its job reliably and with precision over a prolonged period of time," Barth explains. Another requirement was that the machine should go into production within the shortest possible time. "We can't afford to try things out and make trial parts," says Barth.

Less reworking necessary

Mitsubishi Electric also made a precision landing in this important area. And this although, for Daniel Mühlbacher, a toolmaker at GBM, the encounter with the world of Mitsubishi Electric was initially a culture shock. "Our previous EDM system from another manufacturer had been in service with us for many years," he reports, so the usual routines were no longer applicable. However, it quickly became obvious that the shock was entirely positive. Mühlbacher spent a few days at the headquarters of Mitsubishi Electric in Ratingen for a seminar. "Then I was able to work productively straight off and was also able to teach my colleagues how to use the new technology," says Mühlbacher, who is extremely impressed with both the MV2400R Connect technology and the user interface.

In addition to machine's fast cutting speed, the quality of the surfaces is an important factor for the Austrian firm. "Very often, the surface properties of the cut contour strongly dictate the demoulding properties of the injection-moulded component. Good and reliable

Daniel Mühlbacher during CAM program transfer and probing the workpieces prior to machining

demoulding is the key to safe and capable processes," explains Barth. The decisive factor is how much has to be reworked after the cutting process. "This is of course a key cost issue. With the new Mitsubishi Electric machine, costs have also developed very positively," says Barth. Since the machine runs most of the time without operating personnel, the automatic wire threading feature is of immense importance. "We can simply rely on the fact that if a wire should break, the machine will resume working automatically. And not only at the start hole, but also in the workpiece," says Barth.

New system to bolster growth

And, finally, the human factor also came constructively into play. Barth was assisted by Daniel Rieder, specialist consultant at machine wholesaler Büll & Strunz, which has been working exclusively for Mitsubishi Electric on the Austrian market since 2016. "The chemistry was right," says Barth, describing their good relations.

If Barth had to draw a first conclusion, it would look like this: "For us, the investment was important so that we can produce moulds faster than ever now, and their surfaces do not have to be reworked." At present, he is unable to foresee what further advantages the new EDM system might have in store. "I wouldn't say that we've achieved the maximum in this short time in terms of what the machine is capable of.

"But one thing is certain: we want to continue to grow and the machine will support us in our efforts," says Barth. He therefore deliberately opted for a larger machine, which is also equipped with the new D-CUBES interface. "Here I see a lot of potential for exploiting totally new possibilities in the future when producing moulds for our injection mouldings."

GBM Kunststofftechnik und Formenbau GmbH

Employees
80

Founding year
1974

Core business
Production of injection moulded parts and systems as well as moulds and tools for companies in the automotive, electrical, electronics and medical technology sectors.

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Prototyping of high-end precision parts.

Berliner Glas KGaA Herbert Kubatz GmbH & Co.

High-precision prototype production.

From glass finishing to medical technology and space technologies.

The prototyping of high-end precision parts places the highest demands on the available machinery. Berliner Glas therefore decided to purchase a MV2400R Connect wire EDM machine for the Mechanical Workshop & Mechanical Prototyping and Research & Development departments. This technology offers huge potential for sustainably improving the quality of prototypes and thus of subsequent series-produced products as well.

The Berliner Glas Group is one of the world's leading suppliers of key optical components, assemblies and systems, high-quality finished technical glass and glass touch assemblies. More than 1,500 employees, 945 of these at the Berlin headquarters, work for the light-using industry at five locations in Germany, Switzerland and China. The company develops, manufactures and integrates system solutions that are used in medical technology, the semiconductor industry, measurement technology, laser and space technologies, and the display industry. In 2018, the Group generated sales of EUR 223 million.

The machinery available in-house covers all machining processes and comprises various CNC-controlled lathes and milling machines, state-of-the-art multi-axis machining centres and a large number of die-sinking

The company

In 1952, Dr Herbert Kubatz's father founded Berliner Glas as an architectural glazing company with affiliated glass wholesaling. The company launched the mass production of diapositive or slide glass in 1955. This was joined by microscope slides for medical examinations. When the present owner Dr Herbert Kubatz joined the company in the 1960s, a Technical Glass processing department was set up. The company succeeded in attracting more exacting customers. As a result, technical glass from Berliner Glas was used in photocopiers, fax machines, overhead projectors and LCD displays. The transition to precision optics took place in the 1970s. High-quality optical components such as lenses, prisms and plane surfaces were produced. Business with semiconductors grew steadily in the 1990s. The company also expanded into the USA. After the turn of the millennium, the company moved into the display industry, measurement, laser and medical technology and made inroads into the space industry. Having taken over SwissOptic AG among others, another milestone was passed in 2006 with the founding of Berliner Glas SwissOptic Wuhan in China.

Today, the Berliner Glas Group supplies market leaders in selected branches of the light-using industry. Together with their customers, the companies of the Berliner Glas Group develop innovative optical solutions and bring them to series maturity. The key components, assemblies and systems from Berliner Glas make light usable for high-tech applications and can be found in many areas and technical systems: in machines for manufacturing computer chips and OLED displays for smartphones and tablets, in satellite systems that handle communication in space, and in medical devices. For the manufacturers of these machines, Berliner Glas acts as a long-term provider of solutions – from the idea through to series production.

EDM systems. Until now, wire erosion has not been used in-house, with suppliers contributing this technology to production on an ad-hoc basis. The research and development, prototyping and jig and fixture construction units serve the Group's various business units. They also have appropriate machinery at their disposal, which has now been supplemented by the newly purchased MV2400R Connect wire EDM machine from Mitsubishi Electric. Direct access to this wire EDM machine enables these departments to reconcile the designed component geometries with suitable processing steps at the prototyping stage and to check feasibility at the same time. Among other things, this approach facilitates optimal preparation for future technological requirements and the reliable provision of feasibility studies and prototyping. In addition, it also makes parameters and empirical values available regarding material behaviour and production times while providing insights that are likely to be of interest in later series production. Until now, external companies have been commissioned to produce prototypes when wire EDM was required for the machining of an attachment made of titanium, stainless steel, aluminium or ceramics. As the batch size is 1, delivery times may be nine weeks or longer, and this limits the ability to serve potential customers. The declared goal now is to be able to produce a prototype within six weeks at the latest.

Closed lightweight structures for mirrors in space applications

Decision not made easy

In the run-up to the decision-making process, the persons in charge were

Lightweight titanium lens holder as part of an assembly. The EDM machining was done on the MV2400R Connect: 45 mm in diameter, 6.6 mm thick and 0.7 mm web width.

guided by various reference companies that have acquired extensive experience with wire EDM machines. The findings and tests performed were impressive in terms of the demanded parameters. Other big-name competitors were also considered, but ultimately it was the price-performance ratio that was decisive. The investment included the by no means insignificant fine wire option as well as a CNC start-hole drilling machine for the exact positioning of the start and threading holes for subsequent wire cutting. The wire diameters used are 0.05 to 0.3 mm. In addition, the company purchased DCAM, the special CAD/CAM system for NC programming and control, inclusive of multi-axis machining.

"Originally, we were looking to purchase an MV1200R Connect, but since the R&D department was also showing great interest, we were able to increase our budget to meet future requirements with an even more powerful machine, the MV2400R Connect," says Martin Garske, Head of Mechanical Workshop & Mechanical Prototyping Manufacturing. "In the medical applications sector, it is particularly important to meet the requirements of the market with highly sophisticated products such as lens assemblies, mirrors and lenses. Feasibility and prototyping in the handling of high-performance materials that can be processed particularly by ablative processes therefore enjoy high priority. These are primarily high-precision miniature components whose machining requires the tiniest corner radii, highly intricate contours and exceptional surface finish."

The MV2400R Connect impressed with its optical drive system (ODS), in which the tubular direct drive with its linear technology ensures cogging-free movements of the axes and positioning accuracy of ±2 µm over the entire traverse path. With the Precise Finish Circuit, for example, surface qualities of Ra 0.28 µm can be achieved in four steps. On top of this, there was dialogue-supported operator guidance, the machine's good accessibility and the advantageous Intelligent AT automatic wire threading into the kerf. The Connect version also features ergonomic machine design. Set-up, programming, maintenance tasks and much more can be carried out directly at the front of the machine. In addition, there is the neat D-CUBES process monitoring which provides, among other things, information and analyses at a glance. The safety aspect is not neglected either: axial forces, load changes and obstacles in the travel paths are detected by the Crash Protection System. Nevertheless, the machine's outstanding energy efficiency was also welcomed,

Marcel Ballerstein setting up the MV2400R Connect

although it is not so important in prototyping.

Prototypes produced quickly and efficiently

Shortly after the commissioning of the MV2400R Connect in the first quarter of 2018, senior management asked the prototype construction department if an existing product, a lens mount, could be produced with the newly purchased wire EDM machine. It is a highly sophisticated and intricate component for the low-tension mounting of an optical component. The staff recently trained in wire eroding by Mitsubishi Electric in Ratingen were happy to take up this challenge. In fact, they passed the test with flying colours, confirming that they were on the right track. Since glass is very hard and brittle, handling this material requires a certain amount of care. Therefore, point loads must be assessed with great precision in order to prevent cracking or breakage. In the various applications, the optical glasses used have to be gripped, carried, guided and moved. Using the new technology of wire eroding, a solid-state joint was developed with a surface finish of Ra 0.3 and an absolutely smooth, quasi-ground mounting surface. This means that there is no point load for a sufficiently dimensioned surface. To prevent tilting and to achieve the required adaptability in the form of mobility and suspension, two tiny grooves with an offset of 90 degrees were eroded into the cylinder. There is no need for deburring, because eroding always delivers precise and sharp-edged results without burrs.

Solid-state titanium joint. The slots were cut on the MV2400R Connect wire EDM machine.

Cleanroom at Berliner Glas

The brittleness of ceramics is not unproblematic – when drilling through holes for example. This is because the material tends to splinter at the end of a hole, which is often the case when the walls are not strong enough. The tests performed especially with silicon carbide using wire EDM were flawless.

“I’m glad we chose the large machine. In the meantime, we’ve been given the task of making the handling of a curved and relatively solid stainless steel holder for coating parts easier. Conventional machining with complex clamping and high vibration during milling is no longer necessary. With wire eroding, the required material removal has proved highly effective,” says Martin Garske summing up, adding: “We’ve so far come no way near exhausting the machine’s possibilities and are convinced that this technology offers us huge potential for performing future tasks. Wire EDM enables us to significantly simplify manufacturing processes and improve product quality, inclusive of high dimensional accuracy.”

Berliner Glas KGaA Herbert Kubatz GmbH & Co.

Employees
More than 1,500

Founding year
1952

Managers
Dr Andreas Nitze, David Schwem

Core business
Opto-mechanical assemblies and systems

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Profile of Martin Garske

What kind of training do you have?
After my apprenticeship as a machinist, I continued my training in 2009 as a master metalworker.

What qualities do you bring to your job?
Commitment, ambition and a grasp of technical things.

How did you earn your first money?
On a paper round while still at school.

What's your motivation?
Here I follow Philip Rosenthal's quote: "If you stop getting better, you stop being good."

What do you like most about your job?
The constantly changing tasks and the preoccupation with new technologies.

How do you recharge your batteries outside work?
With my varied sporting activities and of course by spending time with my family.

Martin Garske, Head of Mechanical Workshop & Mechanical Prototyping Manufacturing, Berliner Glas KGaA Herbert Kubatz GmbH & Co

Benefit from high vertical integration.

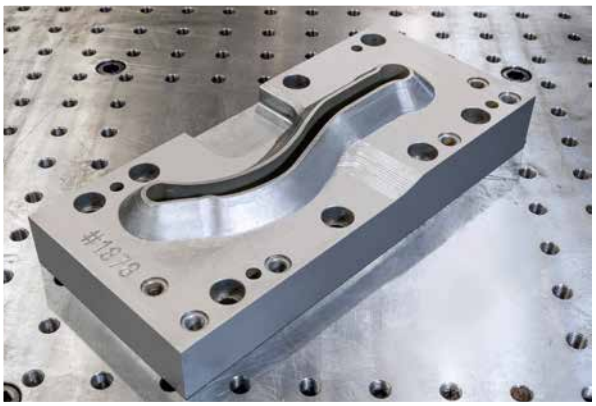
Stubai KSHB GmbH

Profitable production

with creative strategies.

In the Stubai valley in Austria, the Stubai KSHB GmbH drop forge produces a wide range of high-grade steel and aluminium components for a variety of industries. The keys to its success are its high degree of vertical integration, employees acting on their own responsibility, a cooperative structure and its own toolmaking department.

Wire-cut trimming dies made of hardened cold-work steel for the forging industry



Operator Sandro Dietl preparing the workpiece for machining

Stubai KSHB GmbH in Austria has developed very successfully in recent years as a competent supplier to industrial companies. The Tyrol company increased its sales from just under EUR 15 million in 2009 to EUR 41 million in 2018. Ernst Dummer, Managing Director in Fulpmes, reports that this extraordinary growth is based on a broad foundation. In his opinion, the company's cooperative structure, for example, makes a significant contribution to the company's success. Several cooperative companies in the Tyrol region assist each other, he continues, by offering a much broader range of services than any one company by itself. "Many of our customers appreciate the offer of a complete package of services from a single source. This gives them just a single contact person who can clarify all the details for them and supply a complete product," says Dummer. In this way, the firm in the Stubai valley arranges to have its forged, thermally treated and machined components coated or painted by partner companies, for example.

Dummer mentions the special structures in his company as a further reason for being able to produce competitively in a high-cost region in the heart of Europe. This applies just as much to his commercial assessment of the business and as to his relations with employees. "As part of a cooperative, we're not interested in maximising the dividend. We see our task as one of preserving and developing our businesses and the jobs associated with them over the long term."

The Tyrol firm has also optimised its internal processes over the past few years, implementing short information paths coupled with lean structures. This allows it to work highly flexibly and respond quickly to changing order situations.

Benefiting from high vertical integration

In addition, the Stubai valley forge has high vertical integration. It is capable of thermally treating its forged workpieces, e.g. normalising and hardening them. In addition, it processes the components by drilling, turning, milling, grinding and deburring. The component suppliers in the Stubai valley also build ready-to-install assemblies in consultation with their customers. For this purpose, they have an internal toolmaking and equipment construction department at their disposal. As Dummer proudly reports, in this constellation he also sees his company excellently positioned beyond the immediate region. Stubai KSHB GmbH is the drop forge with the greatest vertical integration, he claims, when the large dimensions of the components produced here are taken into account. This also ensures a high degree of flexibility. “Our customers particularly appreciate flexibility. From us they can reliably expect even smaller series of ready-to-install components within the shortest delivery times.”

Competent and responsible skilled staff

In implementing such a corporate strategy, Dummer benefits from his excellent relations with his employees, always trusting in their expertise in their respective fields. He avoids giving direct instructions, he says, but assigns jobs to various units. “Freedom and responsibility instil the confidence on which employees can make the best-possible decisions for their particular unit and the company. Our experience with this has been excellent,” he adds.

This applies in particular to internal toolmaking and fixture construction where the specialist staff mainly produce punching and cutting tools. These are mainly used for removing forging burrs from the workpieces. In addition, the toolmaking and fixture construction department in Fulpmes designs and builds complex systems for the automated production of components. These can be anything from special systems for transporting, inserting and removing forgings to fully automated robot cells. With the latter, the company automates, among other things, the loading and unloading of workpieces from lathes and milling machines and cleaning and measuring stations. In some production areas, fully automated, unmanned production has been achieved. Dummer says: “Our aim is to let the machines work productively for as long as possible unmanned. That’s why we’re automating many parts of our production.”

MV2400S NewGen proves itself in toolmaking and fixture construction

In the Stubai valley, this is primarily due to the high level of expertise of the employees in toolmaking and fixture construction. They also work largely on their own responsibility. In order to expand their capacity and improve their process reliability, toolshop manager Sandro Dietl’s employees decided to invest in an MV2400S NewGen wire EDM system from Mitsubishi Electric. This wire-cutting machine comes with a workspace working area sufficiently dimensioned for larger

Stubai KSHB GmbH

Employees
200

Founding year
1987

Managing Director
Ernst Dummer

Core business
Forging, hardening and finishing of high-quality, heavy-duty components developed jointly with customers and the building of ready-to-install assemblies on a contract basis

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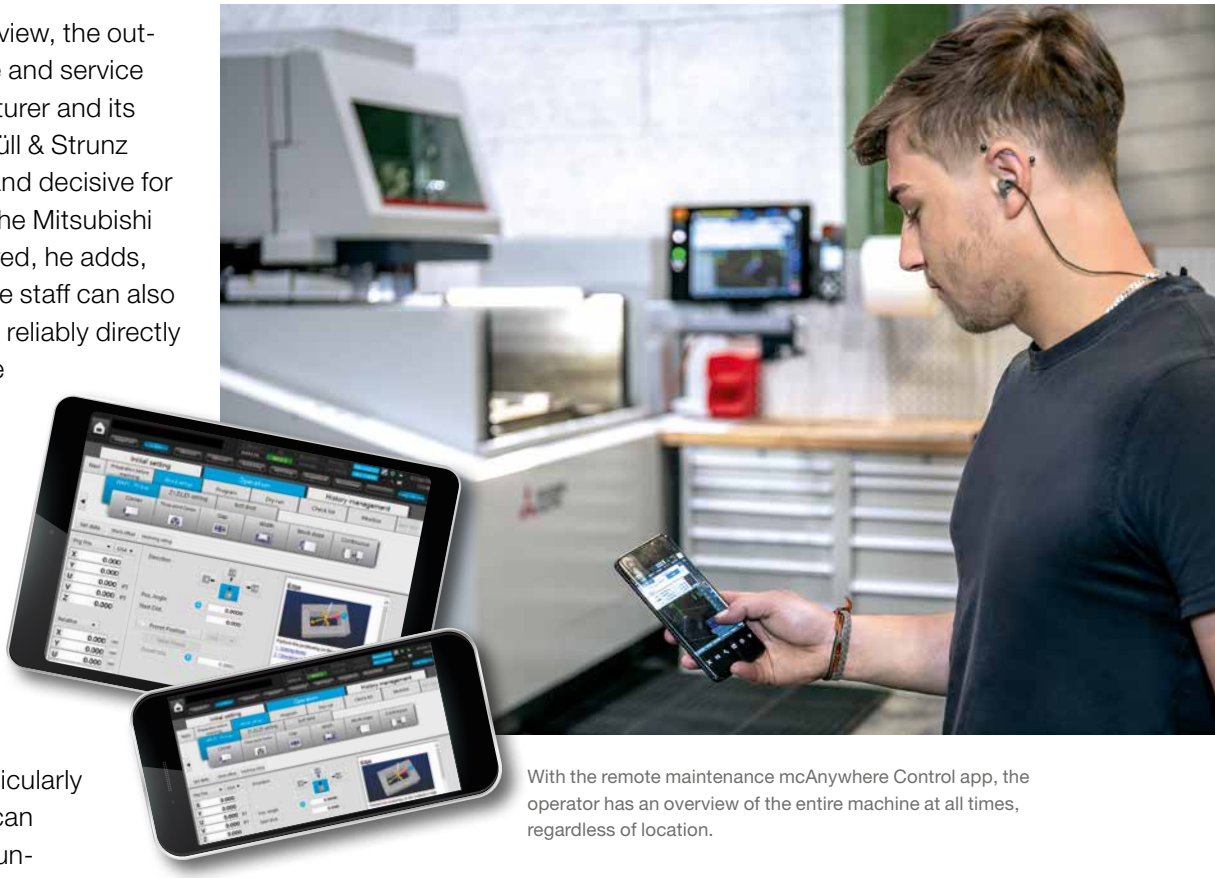
punching tools. In Dietl's view, the outstanding technical advice and service provided by the manufacturer and its regional representative Büll & Strunz were particularly helpful and decisive for the decision in favour of the Mitsubishi Electric machine. If required, he adds, the manufacturer's service staff can also be contacted quickly and reliably directly by telephone. The service staff are always competent and provide technically sound information, Dietl continues. As he further explains, wire EDM is indispensable especially for punching tool construction at the company. "However, our wire EDM machines have to be particularly reliable, as only then we can let the machines work in unmanned shifts. We need this to quickly and flexibly machine and rework the large number of punching tools and fixtures required at the forge," he adds. He confirms that, on the basis of on initial experience, the MV2400S NewGen purchased in January 2019 has been operating reliably in every respect. The particularly dependable automatic wire threader has a major hand in this. The MV2400S NewGen in the company's toolmaking and fixture construction department is also equipped with an extra wire station (20 kg) for sustained production operations.



With the remote maintenance mcAnywhere Control app, the operator has an overview of the entire machine at all times, regardless of location.

Smartphone control

Dietl and his staff are particularly proud of the mcAnywhere Control option, as this enables the machinists to display and operate the entire control terminal on their smartphone using an app. "This further improves flexibility when operating and monitoring the MV2400S NewGen wire EDM system. Wherever we are, we can

The MV2400S NewGen always guarantees the reliable probing of a wide variety of workpieces.

Outstanding technical advice and service.

quickly and easily check machine and process parameters and, if necessary, correct them," Dietl adds. "This way we avoid unnecessary stoppages," Dummer continues. "In addition, the wire eroding machine is capable of running completely unsupervised during evening and night shifts. This takes a lot of strain off our personnel, as they don't have to work multiple shifts." The MV2400S NewGen works more than 300 hours productively per month, i.e. about 12 hours per day, even though the tool-making and fixture construction staff only work in single shifts. It thus goes a long way to ensuring that the company in the Stubai valley, a cost-intensive production location in the heart of Europe, can hold its own against fierce global competition.

The wire eroding machine is capable of running completely unsupervised during evening and night shifts. This takes a lot of strain off our personnel, as they don't have to work multiple shifts.

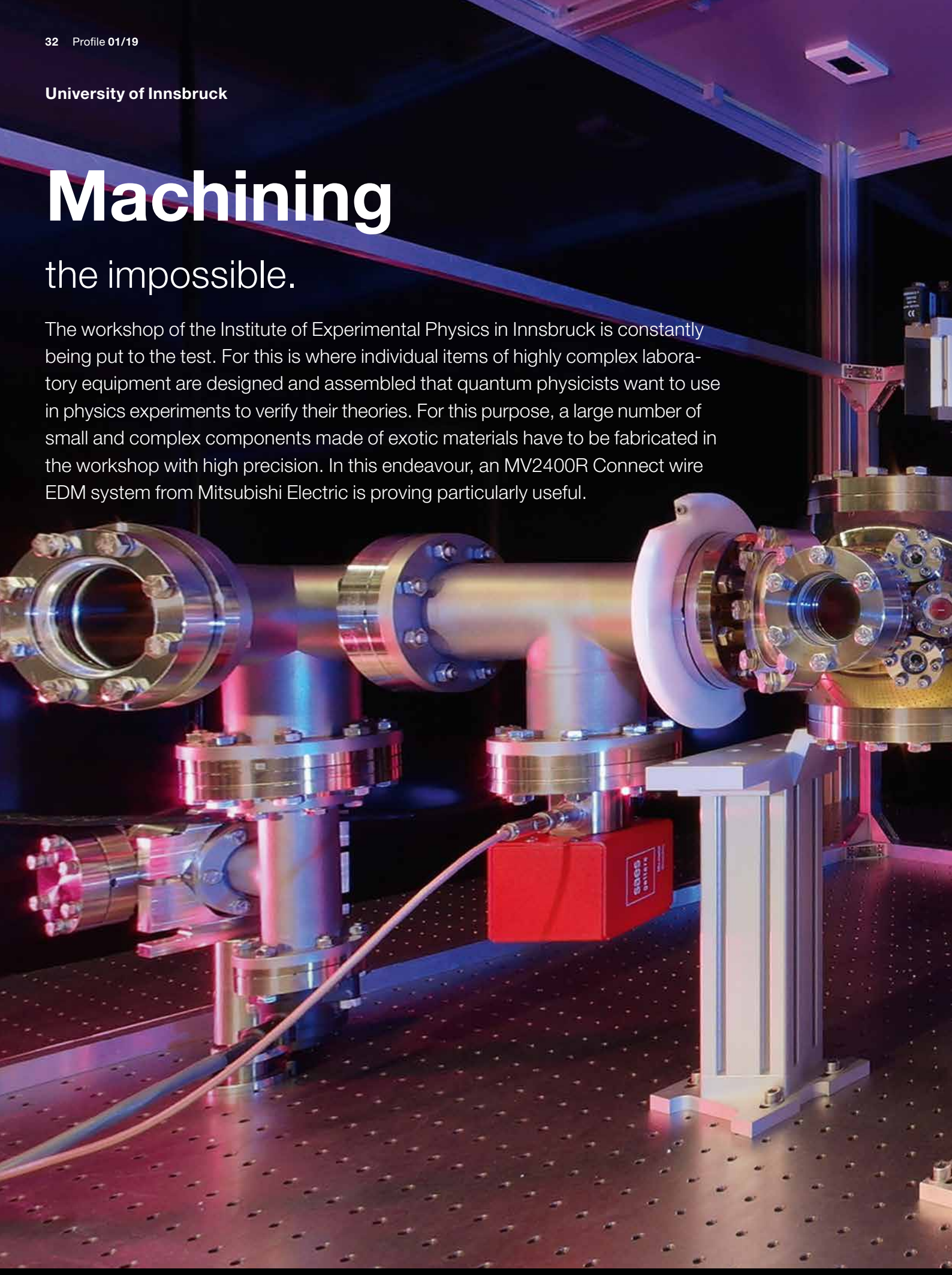
Ernst Dummer, Managing Director of Stubai KSHB GmbH

University of Innsbruck

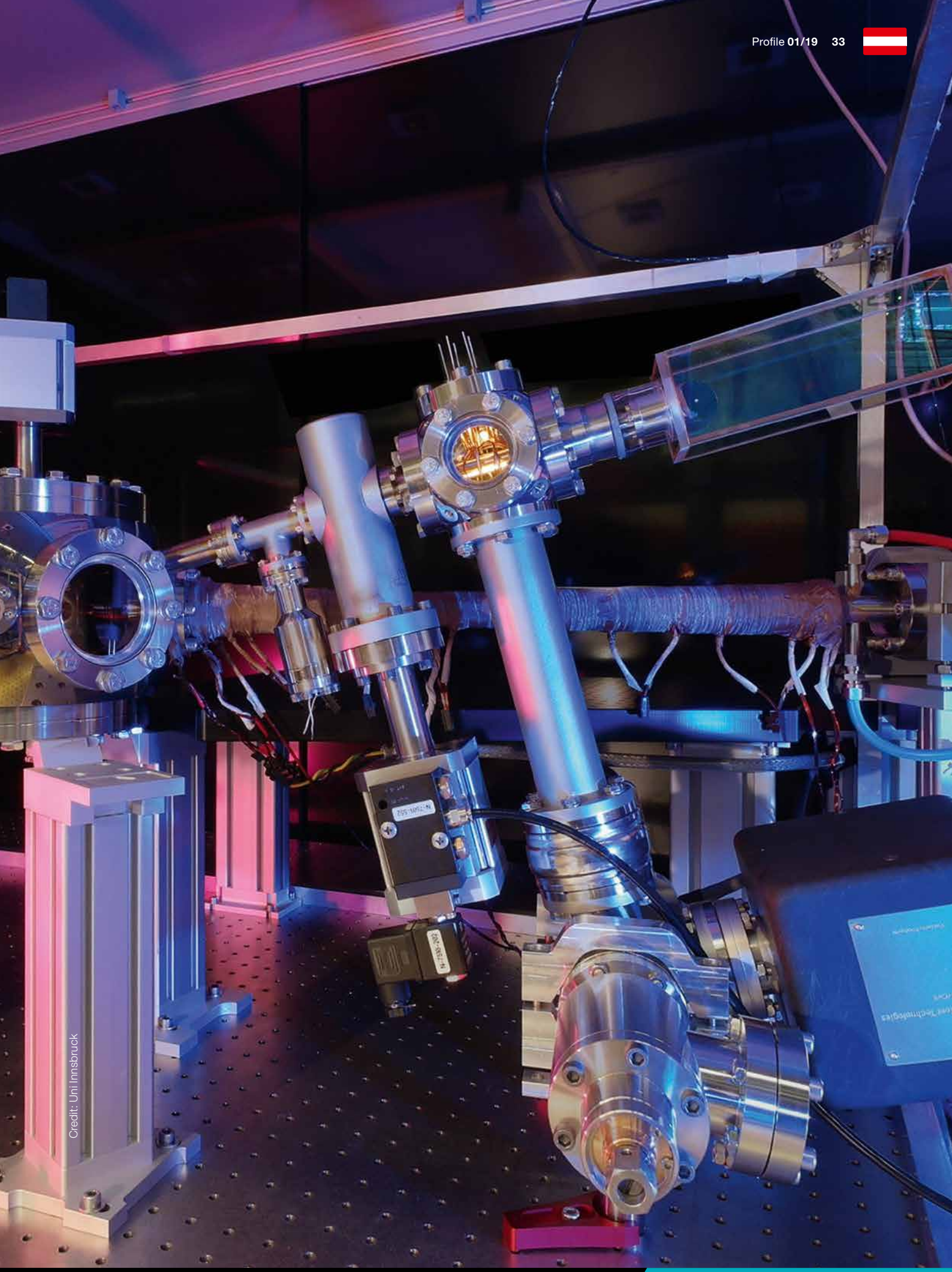
Machining

the impossible.

The workshop of the Institute of Experimental Physics in Innsbruck is constantly being put to the test. For this is where individual items of highly complex laboratory equipment are designed and assembled that quantum physicists want to use in physics experiments to verify their theories. For this purpose, a large number of small and complex components made of exotic materials have to be fabricated in the workshop with high precision. In this endeavour, an MV2400R Connect wire EDM system from Mitsubishi Electric is proving particularly useful.



Components made of exotic materials.



Credit: Uni Innsbruck

Special skills are demanded of the staff of the university workshop at the Institute of Experimental Physics in Innsbruck. For it is their job to design and build the best-possible laboratory equipment for the experiments that have been newly conceived. In Innsbruck specifically, this means elaborate apparatus – such as vacuum chambers, optical systems, measuring devices with high-resolution optics and other, highly sensitive sensors. To this end, housings, carrier elements, flaps and sealing discs, cooling bodies and tubes have to be produced, most of them made of exotic materials that are difficult to machine, such as titanium, titanium aluminide, corrosion-resistant steel alloys, and copper and aluminium alloys. As Armin Sailer, head of the mechanical workshop, reports, his employees use all the usual metalworking processes, ranging from filing and sawing to drilling, turning, milling, grinding and wire cutting. He also proudly mentions that his workshop is often even capable of machining the impossible with ingenuity and a great deal of skill.

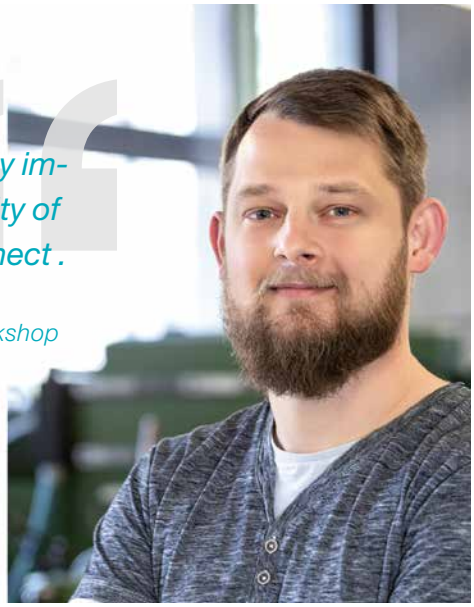
Convenient operation with integrated axis crash protection on the MV2400R Connect.

Processes better kept in-house

According to Sailer, wire EDM is indispensable for hard materials that are difficult to machine and for the machining of tiny geometries. Milling simply takes too long and also runs up against its physical limits. This applies in particular to the production of narrow grooves and other openings with sharp corners or radii of less than a millimetre. For several years, he and his colleagues used to get a neighbouring institute to machine workpieces for them on its wire EDM system. But that proved to be inflexible and often held up the entire production process and delayed the completion of the required laboratory equipment. In addition, the working range of the other institute's wire EDM machine was too small for an increasing number of workpieces. This is why, after almost five years of planning, the Institute of Experimental Physics invested in an MV2400R Connect wire EDM system from Mitsubishi Electric in 2018. An essential factor in the choice of this machine over a number of rival products was the extremely attractive ratio of investment cost to the machine's range of functions.

User-friendly and easy to operate

As Sailer confirms, this choice has been fully vindicated. In his view, the good training, detailed consultation and expert after-sales service of the regional, exclusive specialist dealer Büll & Strunz contributed to this. As a further important factor he mentions the modern user interface of the MV2400R Connect controller. With its structure and pictograms similar to the apps on smartphones commonly used today, it is easy to grasp, especially for young technicians. In addition, the CNC control on the wire EDM machine can be operated and programmed via a touch screen. Thus he and his employees learned within a short time how to operate the wire EDM machine properly and productively, despite having had no previous training or experience of wire EDM.



More than anything we were thoroughly impressed by the accuracy and surface quality of wire cutting on the MV2400R Connect .

Armin Sailer, head of the mechanical workshop

As Sailer further reports, the drawings for all workpieces are first produced on a Solidworks 3D CAD system in the institute's workshop. The data are then transferred on data carriers to the CNC control where the machine parameters are set and the machining processes are programmed by the operator concerned.

Reliable unmanned operation

On the basis of initial experience in the course of a year, the MV2400R Connect at the Institute of Experimental Physics has even exceeded expectations. Sailer: "More than anything we were thoroughly impressed by the accuracy and surface quality of wire cutting on the MV2400R Connect. For example, when wire eroding a tapered opening over 250 mm long, we achieve almost shiny, polished surfaces in the finishing process." In addition, the cutting lines are exactly straight over the entire length to accuracies of less than 0.01 mm. When cutting even exotic materials such as hard and durable titanium aluminide, Sailer has always achieved impeccable

Some of the components eroded are made of high-alloy stainless steels for quantum mechanical experiments.

results with the wire supplied by Mitsubishi Electric as an original accessory. He prefers uncoated wires as these in his view are particularly strong and heavy-duty. Automatic wire threading also works extremely reliably, not only with these wires. “We have been highly impressed by the threader. We can therefore process larger workpieces with a large number of cuts overnight without supervision. In doing so, we can always be sure that we will find the workpiece absolutely correctly and completely machined next morning,” Sailer stresses.

New technologies such as rotary eroding are also used in the workshop of the Institute for Experimental Physics in order to meet the ever tougher requirements in terms of component complexity.

Rotary axis for complex components

As a special feature, the MV2400R Connect in the institute workshop in Innsbruck has an NC rotary axis. Sailer explains: “We installed this optional item because we repeatedly have to machine some extremely complicated components. With the NC rotary axis, we are ready for any work that may be required. For example, we have already been able to put the optional equipment to good use several times in the high-precision machining in a single process of, for example, nozzle tubes with fanned grooves distributed evenly and unevenly over the diameter.” The NC rotary axis has a direct measuring system, which is why it works so precisely. The specialists in the workshop for experimental physics benefit from this when machining very small workpieces with a large number of grooves cut with high precision and openings around the workpiece circumference. In addition, they are capable of accurately cutting simultaneously interpolating conical contours and contours otherwise arranged at spatial angles.

University of Innsbruck, Institute of Experimental Physics

University employees

4,825

Founding year of the Department of Experimental Physics

1742

Core business of the Department of Experimental Physics

Research in the fields of quantum optics and spectroscopy, ultracold gases and quantum gases, photonics, superconducting circuits and the physics of porous and dense materials

Mechanical workshop employees

3

Core business of the mechanical workshop

Design and production of ingenious laboratory equipment for experimental physics and especially for investigating and verifying phenomena in quantum mechanics

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Larger workpieces are machined overnight.

© Andreas Friedle

Internationally recognised experimental physics

At the Leopold Franzens University of Innsbruck, the Institute of Experimental Physics is part of the Faculty of Mathematics, Computer Science and Physics. The experimental physics scientists conduct research in the fields of quantum information, spectroscopy, quantum optics, cold atoms, quantum gases, solid state physics, photonics and superconducting quantum circuits. Their research work and findings are recognised worldwide.

Historically, the institute can be traced back to the year 1742. This was when a collection of physical instruments, the “Armarium”, was founded in Innsbruck. Many valuable devices have been preserved and can be seen today on the Internet in virtual museums. A special item is the astronomical clock that Empress Maria Theresa donated to the institute in 1776.

In addition to research, the Institute of Experimental Physics is primarily responsible for experimental teaching and for internships in university education leading to BSc, MSc and doctoral degrees. For this purpose, the institute offers a wide range of courses and rooms for lectures and internships. In total, almost 40 top-level professors and internationally recognised scientific staff are active in research and teaching at the institute. They are supported by an equally large number of other scientific staff and about 35 non-scientific employees of the University of Innsbruck.

Valuable and colourful.

Koi carp –

what makes it so expensive?

The Japanese koi, which has become a status symbol the world over, is the most expensive and valuable fish that has ever been traded. The most beautiful examples of the colourful and long-living fish, a constant source of wonder even to the present day, have been sold for up to USD 2.2 million. Large sums of money are spent on the most attractive koi carp each year.

The famous multi-coloured koi that can be seen today bear little similarity to their ancestors which were originally bred for food. From the humble table of the peasant to the Emperor's palace, the koi has certainly come a long way. The koi was originally native to Iran. Professional breeding of the coloured carp started about 200 years ago and transformed the status of the carp fundamentally. What was originally a cheap source of nutrition for the simple rustic became the proud possession of the head of state.

The decorative carp called koi (or "nishikigoi" in Japanese) was bred for the first time in Nigata Prefecture in Japan in 1820. When these specimens were exhibited at a trade fair in Tokyo in 1914, they literally caused a sensation, which has since spread around the world. With their coloured ornamental markings, the noble fish are no longer kept simply as pets but have evolved into a symbol of affluence, prestige and pride. The colourful creatures that we can marvel at today in ponds and aquariums have arisen through selective breeding. The markings depended in part on the way in which fish were depicted and were generally intended to be viewed from above. Both in China and Japan, large clay pots were produced to exhibit the fish. However, it was impossible to view the koi from all sides in such solid clay vessels – at that time the technology for the production of large glass bowls was not yet available.

Culture and distribution

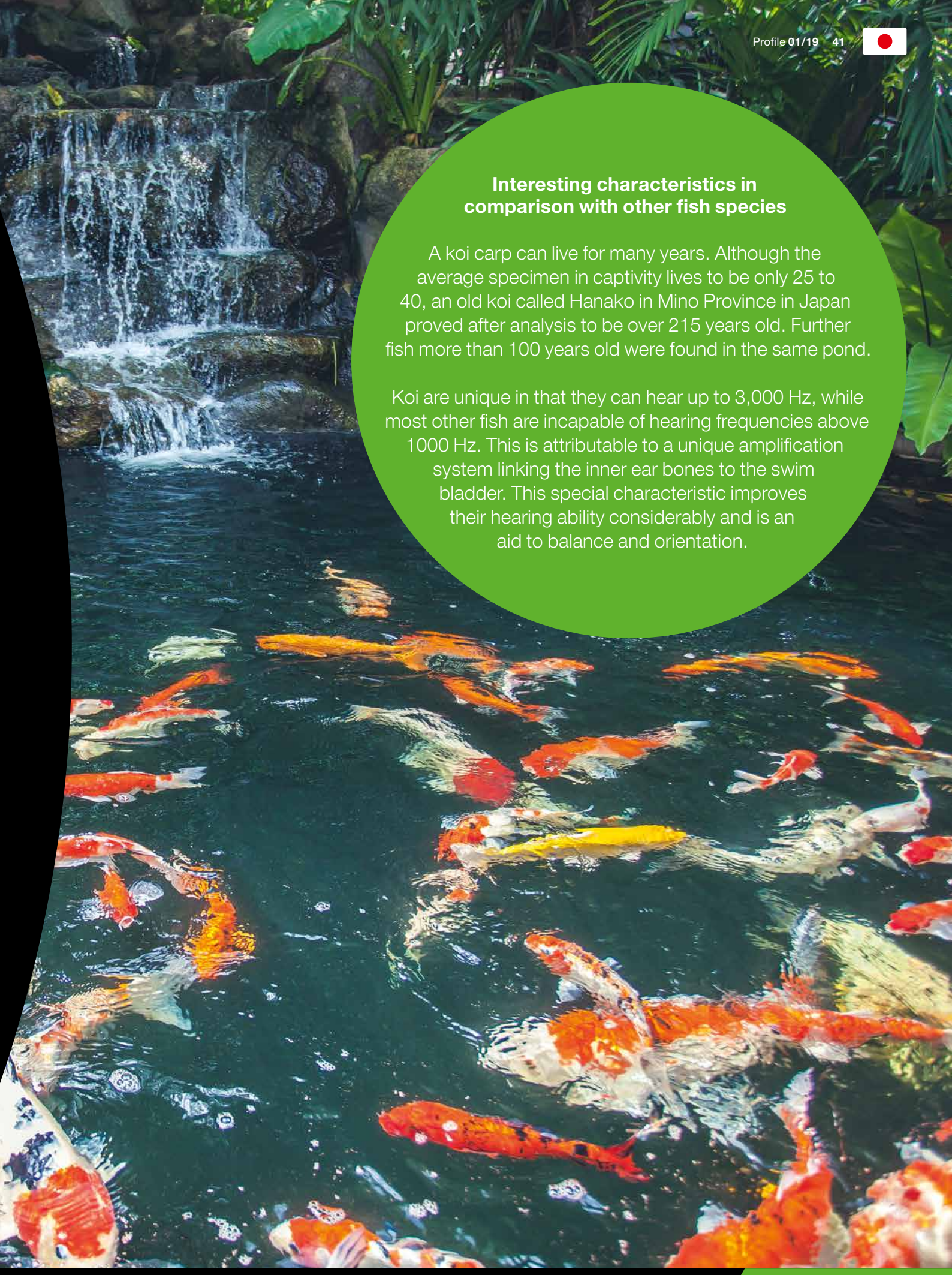
Keeping koi is a popular pastime in Japan today. In Japanese art and culture one can find many illustrations of the koi carp – on decorative furnishings as well as in body ornamentation like traditional tattoos. Ever since the opening of Japan's markets to the world in the 1850s, the cultural influence of the koi, symbolising longevity and affluence, has been exported along with cars and electronics. It is now internationally recognised that the best and most beautiful koi are still bred in Japan. Many leisure breeders travel from all over the world to purchase authentic Japanese koi. It is interesting to note that in Japan the word "koi" is still used as the generic term for "carp", while the rest of the world restricts its use to the species known by the Japanese as "nishikigoi".

Keeping koi – an exclusive hobby

Europe has become a significant importer of koi. Koi means big business and Japanese exports are booming. 90 % of koi bred in Japan are now exported and auctioned all over the world. In 2016 alone, 295 tonnes of koi were sold, generating sales of about USD 31 million. Some foreign owners of valuable koi leave their precious assets at the Japanese farms so that they can take part in the most prestigious fish competitions that are open exclusively to domestic breeders.

A koi carp should not be regarded as an investment that will retain its value. According to most koi professionals, you have to be much more than an enthusiast, as they are much more challenging to keep than other ornamental fish such as the equally popular goldfish. The latter are much more robust and have no problem with disease or cold – unlike the somewhat sensitive koi which is susceptible to infectious diseases and can even suffer from sunburn in summer. A koi pond should be at least 200 square metres large, as the fish can grow to more than a metre long and are social creatures – you should always keep at least two to three pairs together. And then you can take a life-long pleasure in Japan's fascinating "living gems" with a clear conscience.

Fascinating journey of the Koi carp.



Interesting characteristics in comparison with other fish species

A koi carp can live for many years. Although the average specimen in captivity lives to be only 25 to 40, an old koi called Hanako in Mino Province in Japan proved after analysis to be over 215 years old. Further fish more than 100 years old were found in the same pond.

Koi are unique in that they can hear up to 3,000 Hz, while most other fish are incapable of hearing frequencies above 1000 Hz. This is attributable to a unique amplification system linking the inner ear bones to the swim bladder. This special characteristic improves their hearing ability considerably and is an aid to balance and orientation.

Manufacturing with micrometre accuracy.

ITS-Technologies

New potential for EDM systems.

Optimising the machining process with additional axes and spindles.

Multi-axes and spindles have become firmly established in wire EDM. Workpieces with complex structures, high material thickness, extremely sharp-edged contours and the tiniest corner radii can be produced with micrometre precision using this technology. Unlike in milling and grinding, the workpieces are not subjected to high mechanical forces. When it comes to process reliability, EDM technology is vastly superior to competing processes and is ideal for long, complex machining operations and for autonomous unmanned shifts.

Cutting slots in clamping elements

Jochen Hipp, managing partner of the innovative multi-axis and spindle manufacturer ITS-Technologies, sees some room for improvement in wire EDM machines. “They’re wonderful machines for cutting rectangular punches and dies.” However, when machining tapers, for example, they soon run up against their limits. Oblique cuts are often problematic. An eroding machine can incline the wire, but only within a limited range. Larger angles can only be achieved using auxiliary constructions and multiple clampings. But even with gentler angles, oblique cutting with standard machines has its limitations, because oblique cuts are achieved at the expense of accuracy and surface quality. High-precision multi-axes and spindles create an efficient solution here and open up a multitude of new fields of application for EDM. For the developers of such axes, the emphasis is on the efficient, cost-effective machining of workpieces with maximum accuracy and surface quality.

ITS-Technologies multi-axes in the showroom

Additional axes for flexibility

"Our speciality is complete technical solutions for multi-axes and spindles," Hipp explains. "We have concentrated on wire-cutting technology, which accounts for around 90 per cent of our axes. The remaining 10 per cent is divided between measuring technology and special grinding processes." The company was founded in 2010 and has since expanded its product range. Today ITS has a modular system with a large diversity of variants and axes for all common EDM machines. With this system, the company is able to supply axes that perfectly match both the application and the machine. The system starts with axes for machining workpieces with a diameter of 0.5 millimetres and a weight of 5 grams. In the top segment, multifunctional axes process workpieces with diameters of up to 1800 millimetres and a weight of 3 tons.

For Hipp, ongoing new product development and further development is critical. "Our life-blood is our very close relationships with our customers, from which we get direct input, constant new ideas and a wealth of inspiration," says Hipp. Customer-specific developments and process solutions enjoy high status at the company. This includes, among other things, individual adaptation and the design of the axis system, which is precisely tailored to the customer's needs. ITS attaches great importance to always working with the latest technologies. One of the company's principles is not to farm out any of its development work. "We want to keep our know-how and experience in-house," explains Hipp. "For these development processes we have up to five EDM systems from different manufacturers installed at any one time."

Increasing the speed and precision of machining

Multi-axes are individualists. Users who only ever execute straight cuts on simple workpieces have no need for them. All other users enjoy the definite, measurable advantages. Multi-axes can be used to machine complex contours in a continuous process with a single clamping. As a rule, auxiliary constructions are then no longer required, set-up times are shortened and – above all – the processes become more precise. This allows longer running times to be achieved with a high level of process reliability. "To illustrate this, we

From
Ø 0.5 mm / 5 g

to
Ø 1800 mm / 3000 kg

Fast and accurate machining.

have recorded the machining steps in the production of the clamping system with a number of angle sliders," Jörg Springmann, managing partner of ITS, explains, "and machined the workpiece once with and once without the axis. With our additional axis, we accomplished the task goal about five hours faster and a few micrometres more accurately."

Handling the additional axes is very simple. All commonly used programming tools such as DCAMCUT fully support the axes and integrate them perfectly into the machining process without any extra programming effort.

Maximum set-up time 15 minutes

Multi-axes are not required for all jobs and sometimes have to be removed. But the set-up times are manageable. Even with the larger models, both installation and removal are completed in 10 to 15 minutes. For most production processes it is even faster, as only the adjusting screws have to be loosened and the axis lifted out. During operation, the axes can usually be placed directly on a table next to the EDM system. This allows them to remain electrically connected to the machine without being driven by the controller.

Maintenance-friendly

An important issue for all machines and systems is downtime and service intervals. All ITS multi-axes and spindles are maintenance-friendly. The multi-axes require an inspection only after three years or 5000 operating hours. Owing to their greater mechanical stressing, the service life of the spindle axes is shorter. They are subject to higher wear and have to be inspected after about 2500 hours. The next step is to replace the seals and check the moving elements.

Jörg Springmann and Jochen Hipp

Our life-blood is our very close relationships with our customers, from which we get direct input, constant new ideas and a wealth of inspiration.

Jochen Hipp,
Managing Director of ITS Technologies

In addition to multi-axes, the company also specialises in the development and manufacture of spindle technologies. In contrast to multi-axes, which turn at a maximum of 25 times per minute, spindle axes are fast-running. They operate at up to 3000 revolutions per minute and are designed for a maximum concentricity of two to three micrometres.

ITS-MA2-i-115 hollow axis application: mandrel groove machining

Better results thanks to wire-cut grinding wheel

Sometimes a chance incident paves the way for new developments. Dressing metal-bonded grinding wheels with die-sinking EDM has been common practice for a long time. “A friend of mine accidentally dropped a special grinding wheel,” says Hipp. “A piece broke off, and the delivery time for a replacement was a few weeks, but the delivery deadline for the workpiece was imminent. So I gave it a shot: I mounted the damaged wheel on a spindle and re-dressed it on one of our wire EDM machines.”

ITS RSI80 rotary spindle application: profiling and dressing of metal-bonded diamond and CBN grinding wheels.

The result looked good and Hipp took it back to his friend. The initial grinding results were staggering. The eroded grinding wheel was far superior to the previously used wheels in terms of accuracy, cutting speed and, in particular, tool life. Until then, the grinding shop needed one grinding wheel to process one milling cutter. Using the eroded grinding wheel, it managed four.

For ITS, this is an important reason to devote plenty of attention to this area. “Wire EDM dressing is ideal for metal-bonded CBN and diamond grinding wheels,” says Springmann. “In wire EDM dressing, the EDM wire serves as the tool, cooled effectively in a deionised water bath, without any mechanical stressing. This contactless method with spindle axes meets the most exacting concentricity requirements of less than 0.002 millimetres. In addition, this process ensures maximum profile accuracy. This makes it possible to create intricate contours that were previously impossible to produce and to precisely machine inner contours with radii of 0.05 millimetres. External radii are only limited by the abrasive grain size and the bonding material employed.”

Innovative engineering

Today ITS has comprehensive expertise in the production of grinding wheels. This also includes a database with a large number of machine parameters for the processing of grinding wheels. “Our goal is not to manufacture grinding wheels,” Springmann stresses. “We are an innovative engineering company that concentrates on developing and manufacturing multi-axes and spindles. We want to provide our customers with optimal tools with which they can accomplish their tasks faster and more cost-effectively.”

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IT security in Industry 4.0.

Hot Topic

Top marks for technological commitment –

but safety culture trails behind.

Industrial SMEs are stepping up the pace with the Internet of Things and Industry 4.0 – which is basically only right and proper. But in one area there is still a problem with implementation.

By linking the physical and virtual worlds, the digital transformation of the economy represents a historic turning point for industry. Processes, production, products and services are changing radically.

With the aid of technological innovations and an expanded understanding of automated production processes, industry is becoming more flexible and innovative than ever before: production resources are being networked, processes are being automated and production robots are in tireless action day and night. In the digital factory, rigid production structures are being transformed into modular, efficient systems. This means that formerly "dumb" machines and the products they make are evolving into "smart objects" that communicate with each other and contain within themselves all the proprietary, production and logistics information. The necessary infrastructure for this is the Internet of Things (IoT). This is, so to speak, the grey eminence in the background, without which nothing can happen, networking is impossible and Industry 4.0 is a non-starter.

According to a recent study by Deutsche Telekom, industrial SMEs are well on their way to expanding these technologies. "90 per cent of companies in the logistics, transport and supply sector are already using the IoT today and are planning further expansion. We currently see the biggest wave of introductions (40 per cent) in industry," it says. That's the good news. But 82 per cent of the same small and medium-sized companies see the greatest need for investment in connection with IoT projects in IT security – this is the other side of the coin.

The Internet of Things ensures faster and more efficient production processes, "but at the same time increases companies' risk of becoming the victims of online attacks. Accordingly, data protection is becoming increasingly complex, time-consuming and expensive for companies," says a study by Roland Berger Strategy Consultants. The reason for this is the new value creation networks created by the IoT. When billions of things are networked with each other, their vulnerability automatically increases. "Coping with hacker attacks is highly problematic because different areas of a company's value chain are often affected at the same time," Roland Berger partner Manfred Hader explains. "Classic IT security areas, however, usually only have business IT in mind, such as communication systems or business applications. Companies should therefore adopt a holistic approach to the problems of cyber security," says the consultant.

Lack of security.

Dramatic effects

If they don't, the effects can be dramatic, says expert Prof. Dr Claudia Eckert from the Technical University of Munich. The consequence is that "harmful codes, for example, can be infiltrated into industrial production lines. Even a minimal 0.5 millimetre divergence of a setting a can seriously affect an entire production system and its processes. Or you change the timing, a system suddenly overheats and a robot suddenly does things it shouldn't. Such attacks pose a huge risk. This is why the issue of the trustworthy digital identity of components, sensors and services is also of great importance in Industry 4.0," says the expert.

tem, keep it up to date at all times, and operate it proactively. This necessitates organisational as well as technical and personnel security during operation.

"Alarmingly low maturity"

Udo Schneider, "security evangelist" at Trend Micro, echoes these sentiments. The Japanese security company recently published new study findings on security in the Internet of Things. To this end, 1150 IT and security managers in several countries were surveyed, revealing that many companies have "alarmingly low maturity" with regard to the cyber security of IoT projects. "Many cyber-attacks are only successful because the victims lack security awareness. This is particularly evident in the IoT sector," says Schneider. It is therefore more of a question of corporate culture than a technical challenge. This is why IoT security must be universally practised, from the boss down to the lowest company level. For example, according to the Trend Micro study, 86 per cent of the IT and security decision-makers surveyed say that IoT threats are not taken seriously enough in their companies. German study participants are particularly critical: 91 per cent of them say that security awareness could be improved, while 47 per cent complain that security

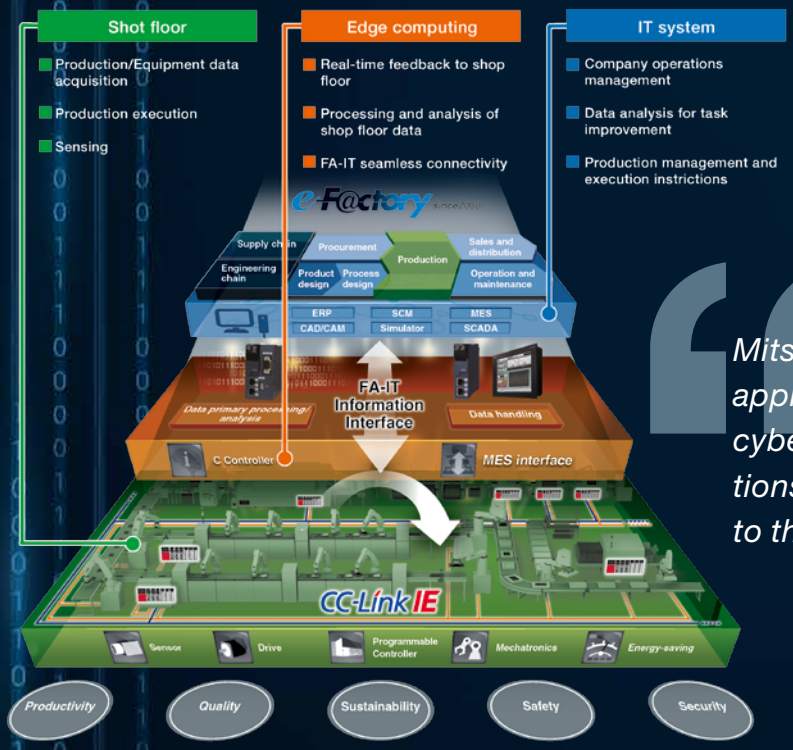
> *Many cyber-attacks are only successful because the victims lack security awareness. This is particularly evident in the IoT sector.*
>
> *Udo Schneider, "security evangelist" at Trend Micro, Japanese security company*

The first outcome is that the commitment to the IoT in Germany's industrial SMEs is excellent, but the necessary security is poor or insufficient. So what should be done? As the first and most important step, the specialists of the digital association Bitkom therefore recommend that IT security should be accorded top priority in the company. Next, companies should appoint their own business protection officers or information security officers, who will then address the issue on a broad front. Accordingly, companies must take preventive action and establish a robust IT security management sys-

is often neglected in IoT projects. This lack of security knowledge, combined with increasing threats and challenges in safeguarding networked devices, "poses a major risk to businesses," the Tokyo-based company says. According to the study, the focus of cyber-attacks is primarily on networked office equipment (in 59 per cent of cases), followed by production facilities and systems in the supply chain.

Technology already available

One thing is clear: there are now enough mature technological solutions for IoT security. Mitsubishi Electric's e-F@ctory approach is a smart way of developing cyber-safe, open edge computing solutions for directly connecting production to the cloud. Because only in the cloud will it be possible in the future to comfortably process the gigantic amounts of data that will also be accumulating in medium-sized manufacturing companies from now on. This strategy initially focuses on neatly collecting large amounts of production data, both from the company's own components and from devices from other suppliers. The freely scalable edge computing solution – with the C-Controller from Mitsubishi Electric as the smallest unit – then processes the data within an automation platform so quickly that delays in the cloud are avoided and real-time production requirements are met. The C-Controller solution transfers the data directly to ERP/MES systems, other cloud solutions or to the company's own applications. The exchange of the data structure is underpinned by security mechanisms and meets the requirements of IT protection through authentication, identification and up-to-date encryption. The result is the desired networking of value creation, while ensuring a high level of security.



Mitsubishi Electric's e-F@ctory approach is a smart way of developing cyber-safe, open edge computing solutions for directly connecting production to the cloud.

In conclusion

It can be said that it is only proper and important that SMEs are committed to the IoT. However, it would be better to show this commitment in the field of IoT security as well. Technically this is possible, and the only thing that remains to be done is to anchor appropriate awareness of this in the minds of the people involved.

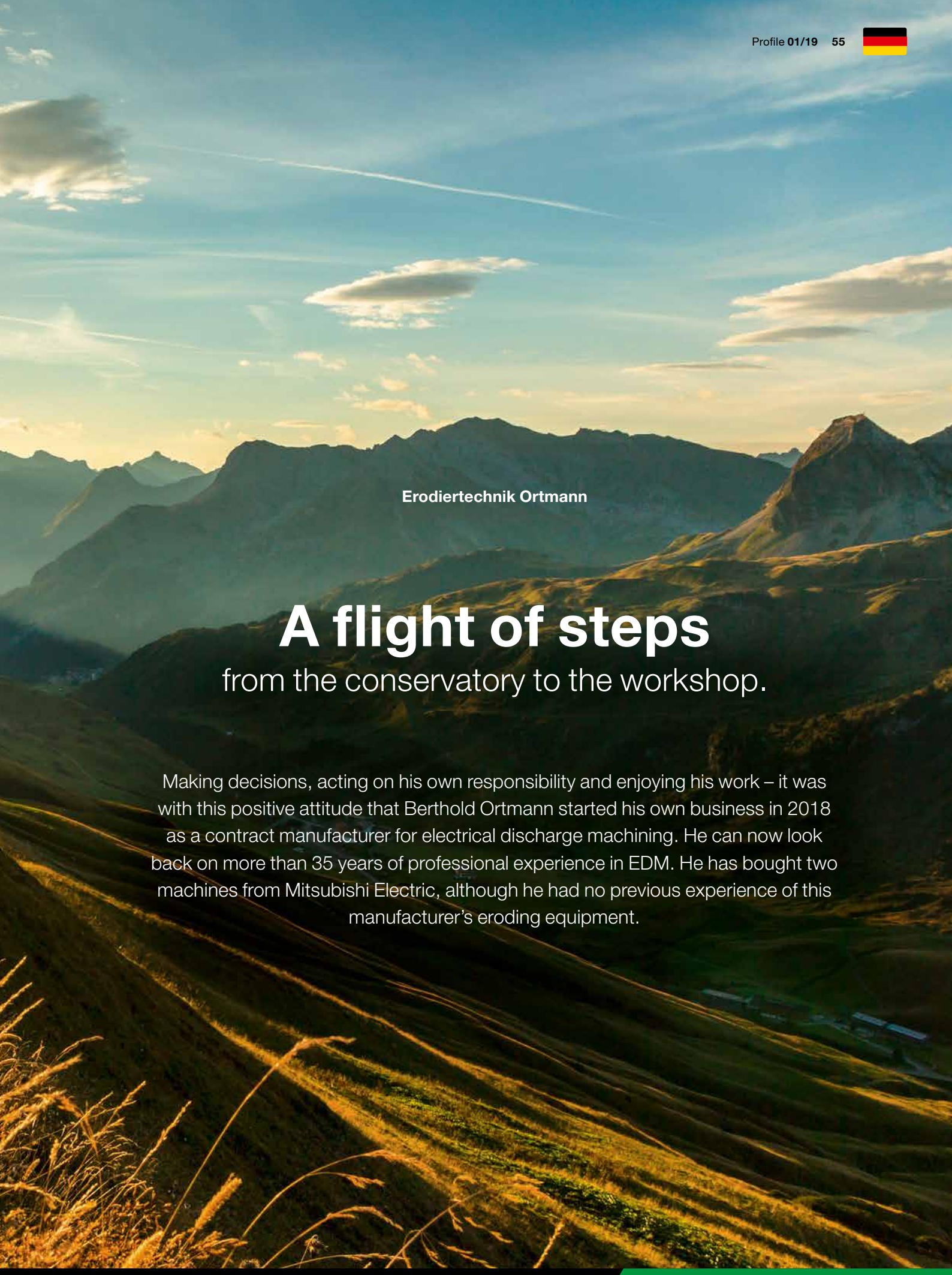
49 % of German companies have incurred some form of loss in recent years as a result of cyber-attacks – large companies with 500 or more employees have been affected slightly more frequently at 58 per cent than small and medium-sized enterprises (SMEs) at 40 per cent.
(Source: Arlington Research on behalf of Kaspersky Lab, March 2019)

74 % of German chemical and pharmaceutical companies have been victims of sabotage, data theft or industrial espionage in the past two years, and another 22 per cent have probably been affected. This is the result of a study by the digital association Bitkom, for which 503 senior managers and security officers from all branches of industry were interviewed. At 68 per cent, companies in the automotive industry are the second most frequent targets – of anything from hacking to file theft. However, machine and plant manufacturers (67 per cent) as well as manufacturers of communications and electrical equipment (63 per cent) were also exposed to a large number of attacks in 2016 and 2017.
(Source: Bitkom, November 2018)

65 % of production environments run on outdated operating systems. “Previously isolated production networks are linked up to the IT network in order to increase efficiency. However, this makes insecure proprietary protocols and potentially decades-old OT devices, which are not patched often enough from the outside due to their great importance for operations, vulnerable to attacks from the outside.”
(Source: Trend Micro, “Securing Smart Factories: Threats to Manufacturing Environments in the Era of Industry 4.0”, April 2019).

31 % of German companies have only one full-time position planned for employees mainly concerned with data protection. Six out of ten companies (59 per cent) have less than one full-time position available for this purpose.
(Source: Bitkom, January 2019)

Jobshop in the Allgäu.



Erodiertechnik Ortmann

A flight of steps

from the conservatory to the workshop.

Making decisions, acting on his own responsibility and enjoying his work – it was with this positive attitude that Berthold Ortmann started his own business in 2018 as a contract manufacturer for electrical discharge machining. He can now look back on more than 35 years of professional experience in EDM. He has bought two machines from Mitsubishi Electric, although he had no previous experience of this manufacturer's eroding equipment.

Contour insert for injection mould

to put his long-cherished desire for independence into practice. Since June 2018, the qualified toolmaker has been working in the spacious garage of his detached house, which he has now converted into a workshop.

Profitable right from the start

In April 2018, Mitsubishi Electric punctually delivered the

Folding core for injection mould

Ortmann only fulfilled his life-long dream of setting up his own business in middle age. At the age of 55 he finally plucked up the courage

machines: a MV1200S NewGen wire EDM machine and a Start 43Z start-hole drilling machine. The man from the Allgäu in southern Germany laughs: “I’d never worked on a Mitsubishi Electric in my previous positions, but always heard a lot of good things about it. Of course, during the preparation phase I had also looked at machines of other manufacturers and compared offers. But Mitsubishi Electric’s were unbeatable value for money and I was swayed by the advice I was given during my visit to the technology centre.”

Ortmann specialises in the manufacture of tools and moulds used in the automotive component supply industry, injection moulding and medical technology, for example. He is not restricted to any particular industry. He has also modified tools and moulds. His customers supply the 3D CAD data for the tool shape, and Ortmann is then responsible for the execution of the order with his high level of expertise. With his many years of experience as a master toolmaker and his extensive know-how as head of EDM in various companies, he’s not easily ruffled.

Enjoying work

“What makes me unique is that, as a one-man subcontractor, I can

I haven’t regretted for a second opting for the MV1200S NewGen wire EDM machine from Mitsubishi Electric. I am impressed by the overall machine strategy.

Berthold Ortmann, subcontractor
Managing Director of Ortmann Erodiertechnik

quickly take decisions and flexibly organise my working hours," Ortmann enthuses. "For me, personal responsibility means accepting an urgent assignment on a Friday afternoon and completing it by Saturday." The Allgäuer has no problem with that, because his workplace couldn't be closer to home: his workshop is only a flight of steps away from his living quarters. He's also aware that the Mitsubishi Electric system can be relied on to do its job. "I used to have to drive back to the firm in the evening and see what was going on, but it's all much more relaxed now." His reward is the pleasure he derives from his work, and he also appreciates the positive feedback from regular customers and, of course, the flexibility. "I'm happy to take the risk of being self-employed. Because now I'm my own boss and have the decision-making authority and responsibility for my

business – that's something I attach a lot of importance to. It feels good, and I appreciate this new quality of life compared to working for someone else."

Start 43Z start-hole drilling machine

Customer base built up with quality and service

Since starting up in June 2018, Ortmann Erodiertechnik has been working consistently for six regular customers as well as for the same number of customers with intermittent jobs. "The regulars know me and can rely on getting their tools quickly and in excellent quality," says Ortmann. "If jobs come in on Friday, I handle urgent repairs by Saturday or Monday." Sometimes even delivery service is included. Since its foundation, the contract manufacturer has experienced steady growth in work, and he regularly receives new jobs. And all this without advertising.

Continuous clamping system – start-hole drilling machine for wire-cutting machine

Since going into business, the company has been able to increase its planned turnover every month, even in the traditionally quieter January. "I never dreamt things would go this well."

Erodiertechnik Ortmann

Employees
1

Founding year
2018

Managing Director
Berthold Ortmann

Core business
Subcontracting – wire-cutting and die-sinking for tools and moulds in different industries
Tool and mould modification jobs – contoured inserts for plastics injection moulds, tools for the automotive industry, tools for the medical sector – silicone processing
Workpieces for custom machine manufacture, one-off jobs in prototype construction

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Short decision paths and flexible working hours.

Interview with Berthold Ortmann, subcontractor in the Allgäu region

What was your goal when setting up your own business?
Enjoying my work – that's my goal. With the two machines from Mitsubishi Electric I have created a really solid basis for myself. They run reliably and efficiently – machines that are based on a mature manufacturing concept. The biggest advantage for me is the automated threading, which works 99.9 % perfectly. I'm astonished by it every time. In addition, the machines' high availability, tolerances and dimensional accuracy suit my business strategy and the workshop conditions in my garage.

Is it true that you never previously used Mitsubishi Electric EDM technology?
Yes, even though I first came into contact with EDM more than 35 years ago. That was when training as a toolmaker. But I heard a lot of good things about Mitsubishi Electric over the years. What I particularly appreciate is that the machine user has the same sales staff as contact persons for many years in order to build up a trusting relationship. The service and maintenance services provided by Mitsubishi Electric were also decisive factors in my decision, because I as a one-man show still get support even on Friday afternoons.

How did you familiarise yourself with the Mitsubishi Electric machines?
After their delivery, I attended a one-week training course at the training centre, which was very well organised and prepared. The trainers provided a lot of theoretical and practical input and addressed numerous issues. I quickly found my bearings with the straightforward operation and control system. At home I only actually took three days to test what I had learned and try out different jobs. By then I'd got the knack of it.

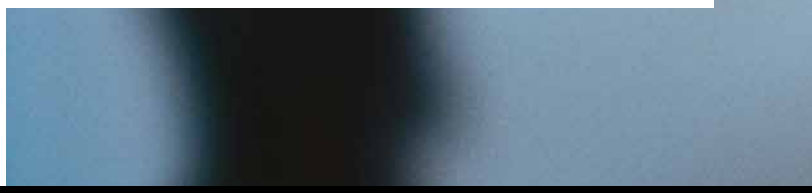
TROB Präzisionsfertigung
Tröstler & Oberbauer GmbH

The never-ending quest

for ultimate precision.

It's the classic situation all over again: Two young men suddenly come up with the idea of starting up their own business. They rent a hall and clear out huge amounts of scrap, buy two optical profile grinding machines and start operating on 1 April 1984 as a contract producer of steel sections for the ball bearing industry.

The company name was soon found. Johann Tröstler and Leonhard Oberbauer decided in favour of the short and sweet name of TROB and took their first steps in successfully developing their company in Winden am Aign. Three years later, the founders bought a site in neighbouring Rohrbach an der Ilm and had their company building erected there. This is a small locality that is not necessarily on the tourist map and yet is a hallowed name for friends of "green gold". The cultural landscape around it, with the world's largest hop-growing area, is intimately associated with the ancient art of beer-brewing – the Hallertau. Agriculture powerfully influenced by hops for centuries was the original point of departure for Tröstler. For his parents made their livelihood from hop-growing and hoped that their son would follow in their footsteps. However, he was more interested in engineering, had a day job and helped out after work in his parents' business. Tröstler remembers his father with great respect: "Although he was unable to keep up with the changing times, he nevertheless gave me financial support in setting up the business. Today Tröstler is TROB's managing director. His partner Oberbauer retired in 2009, remaining loyal to the company until his early death in 2012.



The idea of going it alone.

TROB Präzisionsfertigung

TROB's workforce

"We love the challenge."
With an extra building extension, the production area has now been increased to around 2000 square metres for 35 machines for grinding, milling, turning and EDM. Today's 50-strong workforce, including three trainees on average per year, has made the company a specialist in precision components in small production runs and often in one-offs. The customer reference list reads like a Who's Who of industry – from medical technology to the electrical, automotive and aircraft industries, and from machine manufacture to aerospace. In short, TROB can be found in all areas where precision components and tools – usually wear parts – play a crucial role in machines, systems and equipment. "Right from the start, our goal was to place our products in a

When we invest, we usually first exchange ideas with our customers. This is where we get the best hands-on tips and experience.

Johannes Tröstler – Ing.(B.Eng.)

league that excludes many of our rivals, and that was exactly where we targeted our investments," says Tröstler proudly explaining his strategy. His son Johannes, a mechanical engineer, has been working alongside his father for the last three years. They share a high degree of trust in each other, and Johannes has also made his father's motto "We love the challenge" his own: "Sometimes we have customer requirements that our employees think are barely feasible. That's when our slogan comes into play, because only when it gets tricky does it get interesting." Their core business – as both see it – is high-precision parts that are difficult to produce. This is precisely why the goal is still to aim for high vertical integration of at least

TROB's latest new machine: the wire EDM system MP2400 from Mitsubishi Electric

When things get tricky, they get interesting.

Good results call for high-precision machines and flexible and motivated people. And this is what we've got.

Johann Tröstler,
Managing Director of TROB Präzisionsfertigung

Precision components for special machine manufacture.

95 per cent, because "this is the only way we can assure our quality and meet the customer's wishes for increasingly complex products with complicated interiors." They machine carbide, steel, non-ferrous metals, ceramics and plastics. On average, the machines handle 800 different parts for around 300 customers – mostly regulars.

"On the new one, the wire rethreads spot-on."

Die-sinker EDM has been contributing to the firm's high vertical integration since 1986, joined a little later by wire EDM. Johann Tröstler underlines his recent investment in two machines: "If you want to produce complicated parts with the best-possible precision and surface quality, wire-cutting is a must, otherwise you're going to be disappointed." In 2017, their attention was drawn to the two high-precision machines, the Mitsubishi Electric MP1200 and MP2400, by customer recommendations and through their own tests. The decisive factors for their choice were ultimately the wear-free Tubular Shaft Motor and above all the new wire-threading technology for greater efficiency in unmanned operation. In the event of a wire breakage, the machine threads the wire into the kerf a short distance ahead of the "problem zone" and resumes working. Previously in such cases, the wire had to be manually threaded relatively often–and if the wire snapped at the weekend or at night, the machine was immobilised until the machine operator fixed the problem.

"Accuracy to the nearest micrometre is the highest goal"

The machines' accuracy is plus/minus one micrometre. If the desired tolerances become even smaller, Johann Tröstler sometimes calls these anxiety tolerances, because "then the matter is beyond accurate verification.

Head of the EDM department
Stefan Winter

We mention this to our customers, because openness and honesty are the be-all and end-all".

"Our vision is that today's experience is converted into future solutions that work at the press of a button"

75 per cent of TROB's customers come from Germany, and the rest predominantly from other European countries and a few from the USA, China and India. The two entrepreneurs are proud of the fact that word of mouth in particular is expanding their customer base, repeatedly stressing: "We owe this to our highly skilled and motivated team. Without it, we wouldn't have got this far." Johann Tröstler quips: "Let's see when I can retire – I'm 64 as it is." From his son comes a clear rejoinder, which his father is also happy to hear: "He promised to only leave when I no longer need him, but I'm pretty sure I'm not done with him yet."

PVC nozzle for the automotive industry

TROB Präzisionsfertigung Tröstler & Oberbauer GmbH

Employees
50

Founding year
1984

Managing Director
Johann Tröstler

Core business
Precision parts in single and small series production, prototype construction, punching tool and jig construction

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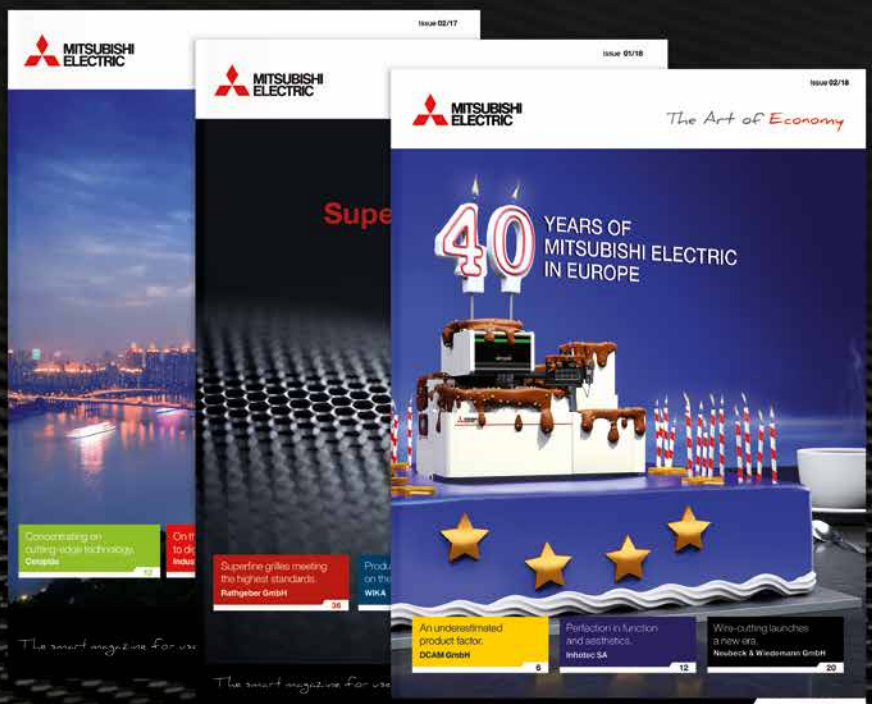

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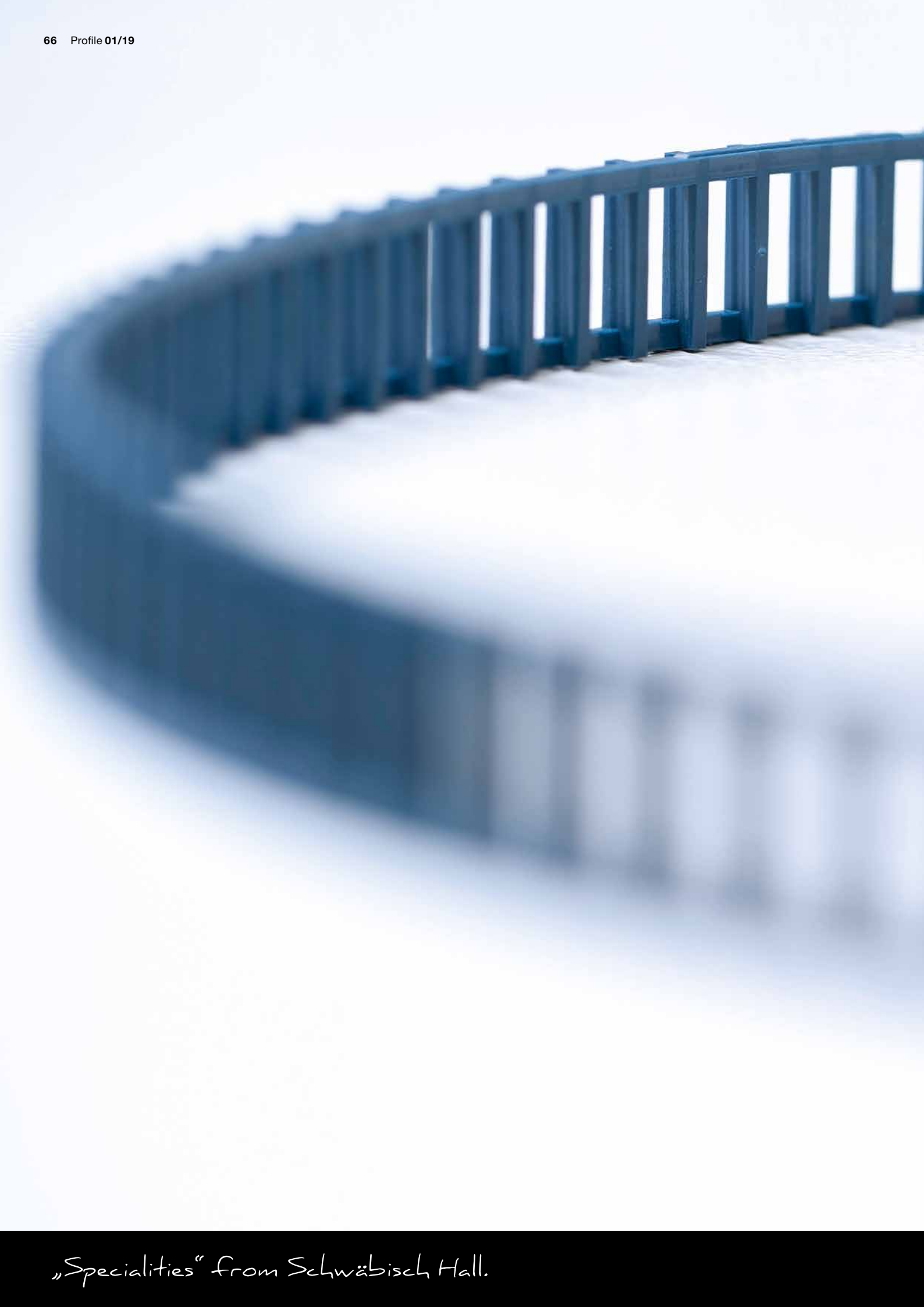


„Specialities“ from Schwäbisch Hall.

Legrom GmbH

All the world's a cage.

Schwäbisch Hall is not only home to a well-known German building society. It is also the town where Legrom GmbH has made its home. According to its managing partner Werner Reinhuber, it produces "specialities". And an MV2400S NewGen eroding machine from Mitsubishi Electric has a big hand in this.

It is mainly plastic rolling element cages that Legrom has specialised in and for which the company also develops and builds the associated injection moulds. Some cage types were even patented in Germany and the USA. What may not mean a great deal to the technical layman, Werner Reinhuber is decidedly enthusiastic about. "We primarily manufacture rolling element cages," he says, "as original parts for automotive suppliers and machine and vehicle manufacturers. All of them high-precision, high-quality and unique. We don't engage in mass-production." In fact, some of these bearing cages have a diameter of only a few millimetres and have intricate seats for a few tiny steel balls. Other cages, obviously for rollers, are an estimated 30 times larger.

Spare parts for spinning machines are a lucrative business. Domestic textile manufacturers have been having their products manufactured abroad for a long time now. A number of companies from this sector have also been taken over by Chinese investors. For reasons of cost, many of them have their machines produced in the China or in other Far Eastern countries. But when the machines required for this start showing their age and have to be overhauled, there is often a lack of high-grade spare parts.

Reinhuber: "In principle, spindle brakes and gripper and feed systems are catalogue goods. They can be manufactured anywhere in the world if the necessary process

Mitsubushi Electric EDM MV2400S NewGen

Overview of various bearing cages in all shapes and colours

know-how is available in addition to the technical requirements. But we've been confronted incredibly often with the claim that the quality of such replacement components is catastrophic. And that's where we take our cue. Our products are distributed via a worldwide network of sales representatives. There are very few countries that we don't serve. And we attach exceptional importance to quality." Not least for this reason, Legrom buys both the plastic granules for the components and the tool steels from which the injection moulds are made exclusively from certified dealers and manufacturers in Germany and the rest of Europe.

The details of almost all commercially available components for spinning machines are stored digitally at Legrom. This way, the experts immediately know their specifications, the composition of the materials and so on. Nevertheless, much is designed with Visi CAD/CAM, a software program ideal for tool- and mouldmaking. Thanks to its CAM system, the geometry data and machining programs generated in the CAD system for the CNC machines are conveniently transferred to Legrom's production department.

Since August 2018, an MV2400S NewGen wire EDM machine from Mitsubishi Electric, has been in operation there, replacing a machine, originally bought second-hand, of the same provenance and somewhat long in the tooth. It was still working with micrometre accuracy, but its control system didn't have an Ethernet interface. "When we cut highly complex geometries, the data volume is correspondingly high," explains Werner Reinhuber. "But the control of this machine was unable to process such amounts of data. We had to 'portion' the data, store it on a diskette and process it bit by bit, which, of course, is an enormous brake to productivity." That's all over with the new machine now. The control communicates via an

Highly complex geometries.

interface with Visi's CAM system. However, the toolmaker can still make minor corrections to the respective cutting program based on his expertise.

Wire-eroded are not only the geometries of the future plastic cage, but also movable functional elements such as slides for demoulding. Reinhuber explains: "What you don't need at all on bearing cages are burrs. However, these form when the functional elements in the injection mould have too much play. We prevent this by wire eroding as many elements as possible. The machine and the process are so precise that the eroded parts are simply a perfect fit with a tolerance of less than five micrometres". Many years ago, he says, such slides were machined, then hardened, "and then it either fitted or it didn't". It is easy to imagine what this means with up to 40 angled slides in a single tool.

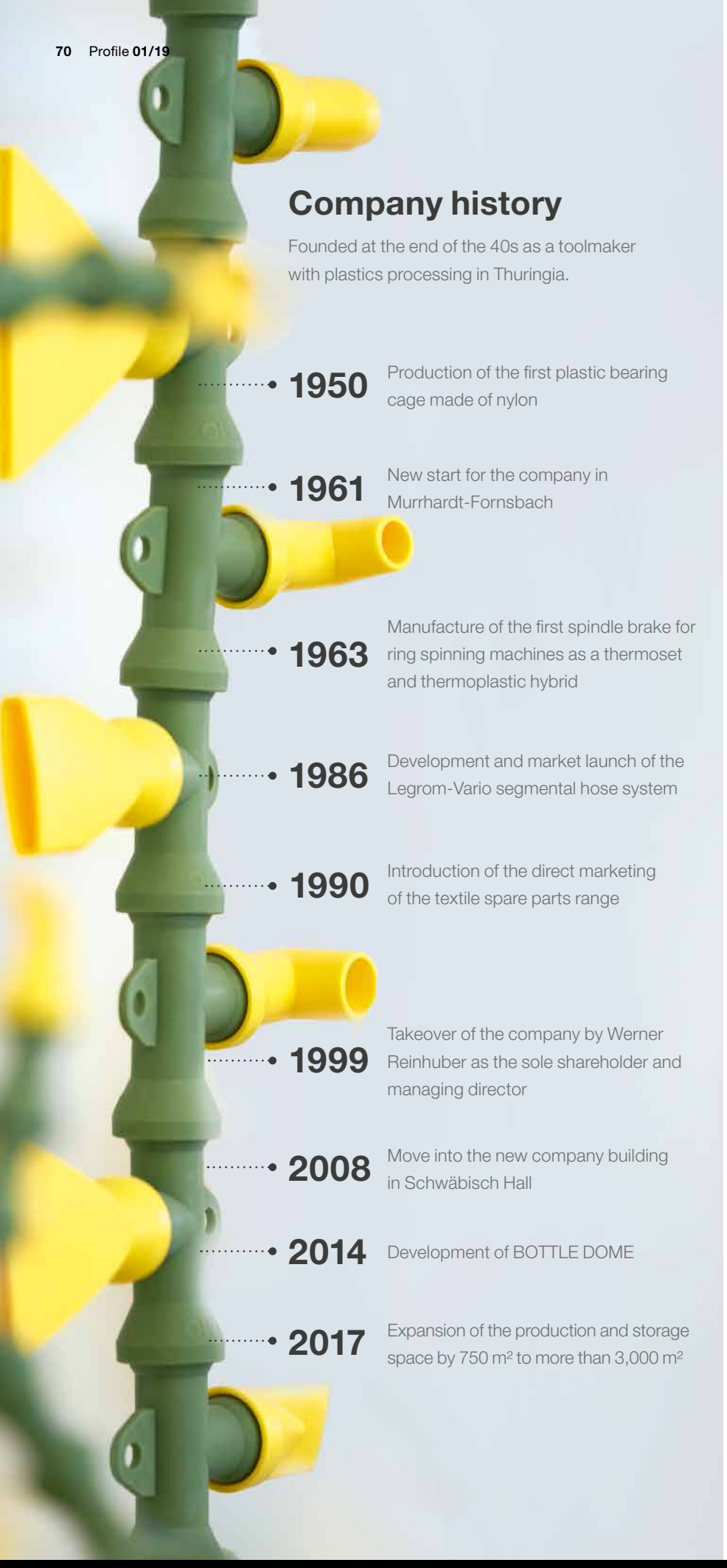
The wire threading of the MV2400S NewGen is much more precise. Thread a 0.25 mm EDM wire into a 0.4 mm hole? No problem. We haven't had a single malfunction with this machine yet.

Werner Reinhuber, Managing Director of Legrom GmbH

Mould insert for radial bearing cage

In addition to the precision and more convenient control of the MV2400S NewGen, Reinhuber praises the increased process speed during wire cutting. This is illustrated by a specific comparison: to process one and the same cutting program, the old EDM system took just under 45 hours, but the new one just over 37.

He is also impressed by the improved automatic wire threading: "When there was a wire breakage on our old eroding machine, it tried to rethread the wire again up to five times. If that didn't work, the machine reported a malfunction. The wire threading of the MV2400S NewGen



Company history

Founded at the end of the 40s as a toolmaker with plastics processing in Thuringia.

1950 Production of the first plastic bearing cage made of nylon

1961 New start for the company in Murrhardt-Fornsbach

1963 Manufacture of the first spindle brake for ring spinning machines as a thermoset and thermoplastic hybrid

1986 Development and market launch of the Legrom-Vario segmental hose system

1990 Introduction of the direct marketing of the textile spare parts range

1999 Takeover of the company by Werner Reinhuber as the sole shareholder and managing director

2008 Move into the new company building in Schwäbisch Hall

2014 Development of BOTTLE DOME

2017 Expansion of the production and storage space by 750 m² to more than 3,000 m²

is much more precise. Thread a 0.25 mm EDM wire into a 0.4 mm hole? No problem. We haven't had a single malfunction with this machine yet."

Reinhuber describes Corehold technology as "a wonderful story". When cutting a penetration, it prevents its inner core from dropping as waste into the tank. For this purpose, the eroding machine reconnects the shape to the core after the cut has been made by applying a previously defined number of tiny spot welds. Previously, such a penetration had to be roughed leaving a tiny web. With the machine switched off, the toolmaker was able to push it out and fetch the core out of tank.

"That was very time-consuming," says Reinhuber in retrospect, "especially when many such openings had to be cut. And on top of that, it tied up personnel for many hours. With the optionally available Corehold function, we can now continuously cut as many openings as we want, even in unmanned shifts or over the weekend. Once the work has been completed, the toolmaker only has to remove all waste parts from the openings. It's quite simple. Afterwards, all that's left to do is trim. That's what I call productivity."

Now eroding is generally not regarded as an energy-efficient machining process. But this was not so crucial for Legrom in its decision to invest in the new wire EDM machine. The company saves energy in other areas – by using solar and geothermal energy and changing the building's lighting to LEDs, for example.

For Reinhuber it was obvious

Volker Bader at microscopic inspection for highest precision

pretty soon that “the new one” would again come from Mitsubishi Electric: “We have been more than satisfied with the old machine for many years. So there was no need to change supplier at all. We formulated in detail all the requirements for the new machine that are important to us. On this basis, Hans-Peter Barth, Mitsubishi Electric’s agent responsible for our area, advised us very competently on the selection of the machine. He also recommended the Corehold function, which I wasn’t even aware of until then. And so the decision for the MV2400S NewGen was taken. It offers many advantages at a reasonable price.”

Legrom GmbH

Founding year
1947

Managing Director
Werner Reinhuber

Employees
27

Core business
Tool- and mouldmaking for the production of injection-moulded parts from plastics and renewable raw materials for the textile and automotive industries and machine manufacture

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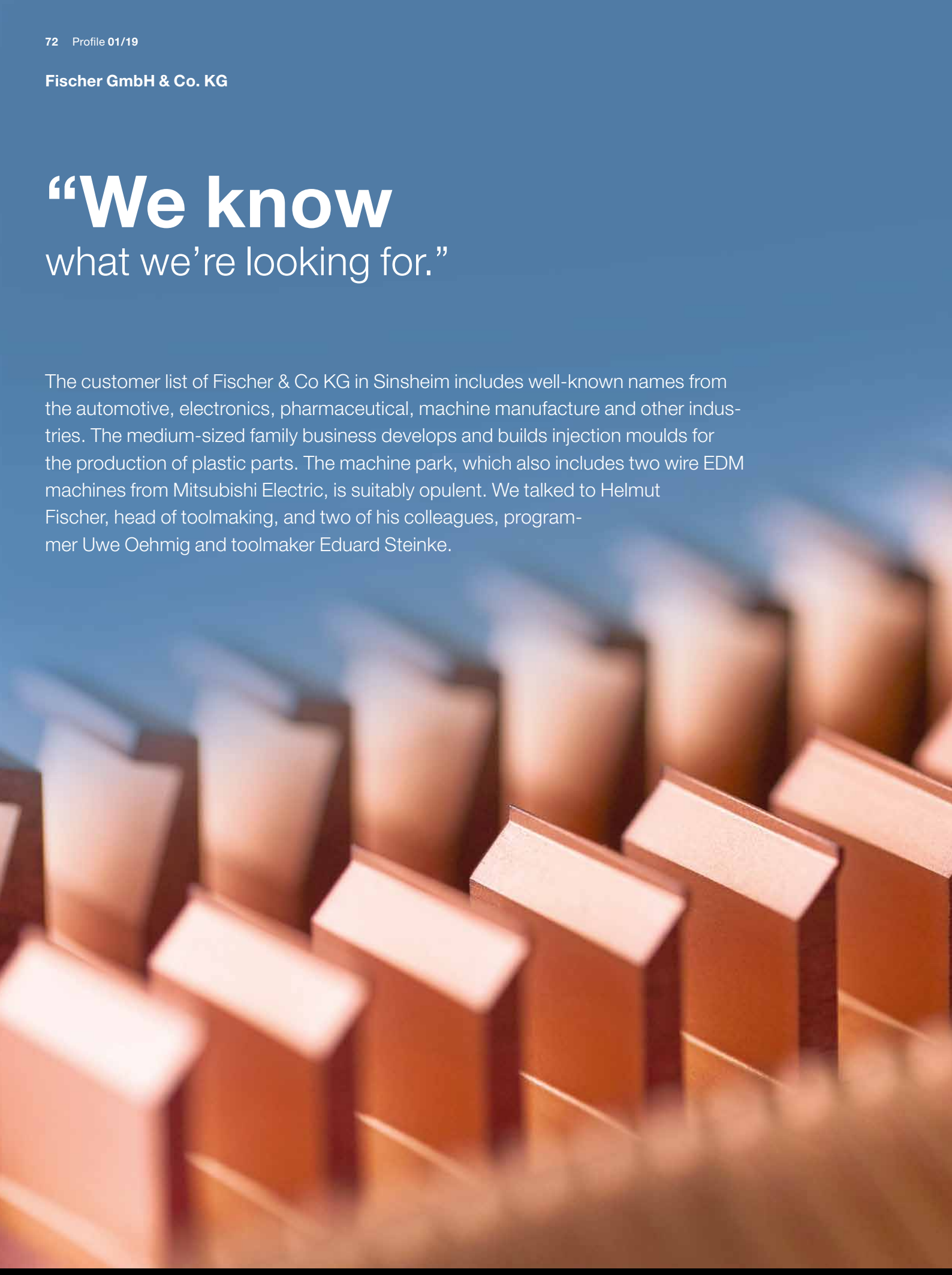
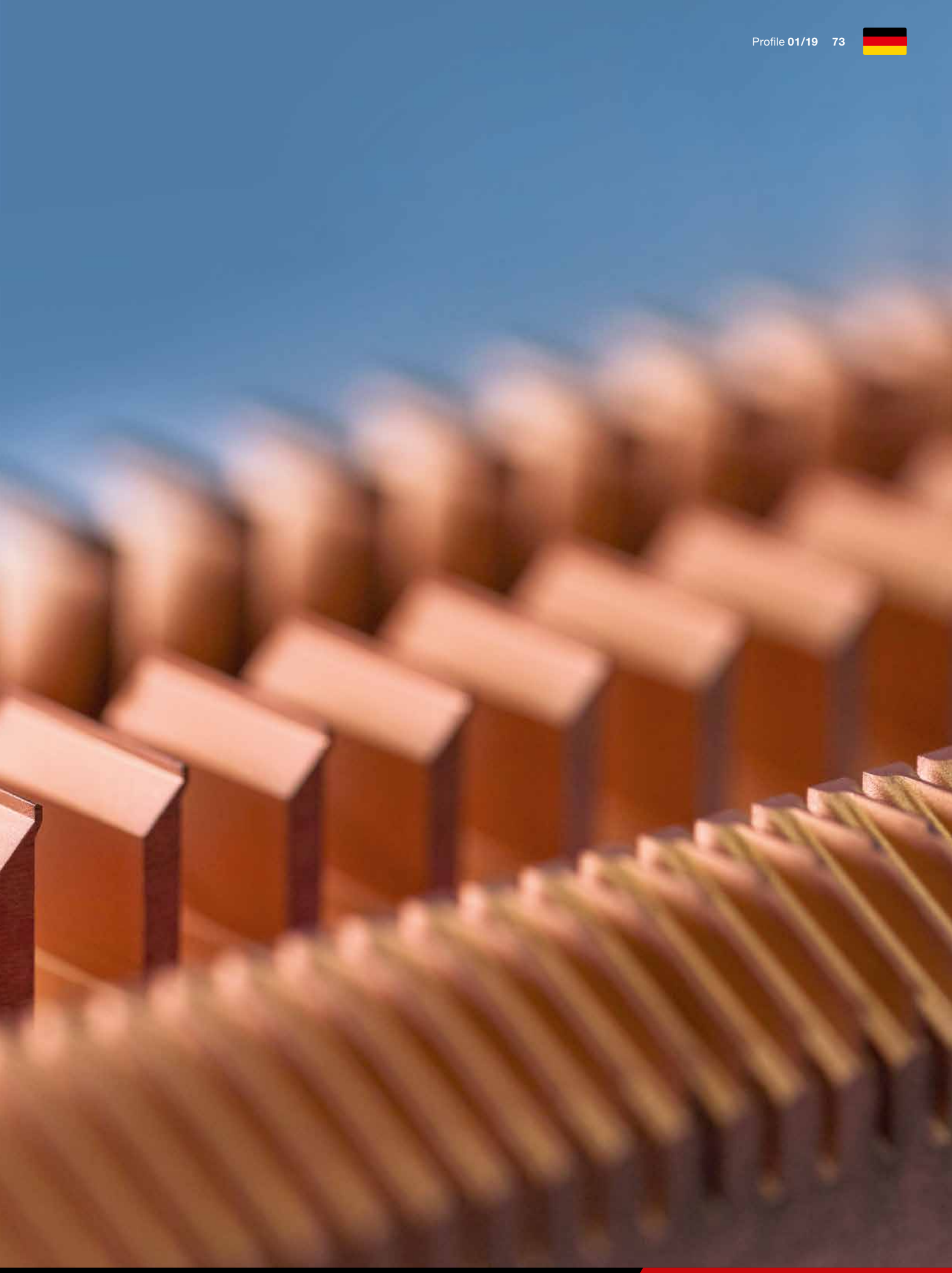
Fischer GmbH & Co. KG

“We know
what we’re looking for.”

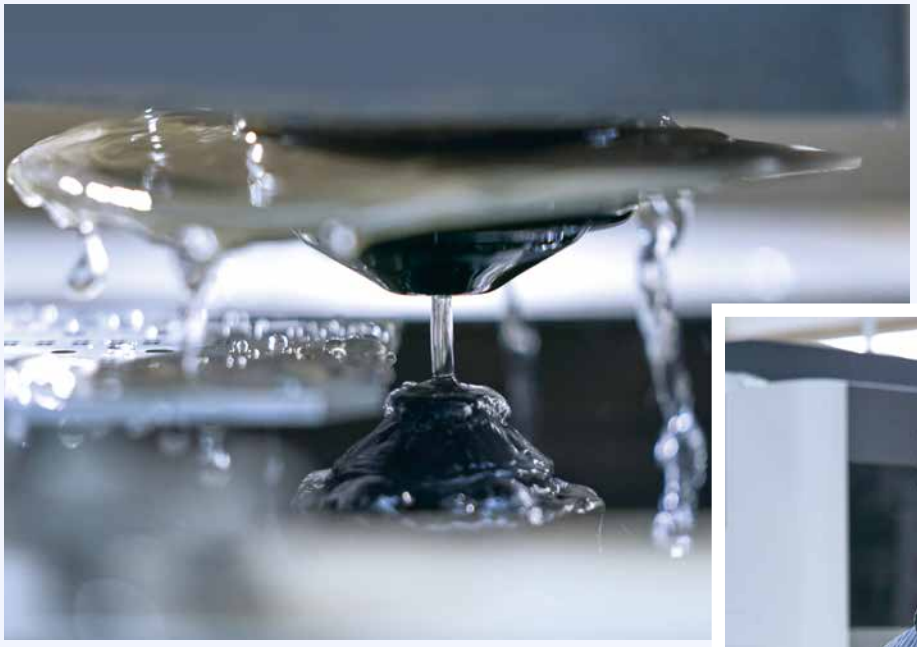
The customer list of Fischer & Co KG in Sinsheim includes well-known names from the automotive, electronics, pharmaceutical, machine manufacture and other industries. The medium-sized family business develops and builds injection moulds for the production of plastic parts. The machine park, which also includes two wire EDM machines from Mitsubishi Electric, is suitably opulent. We talked to Helmut Fischer, head of toolmaking, and two of his colleagues, programmer Uwe Oehmig and toolmaker Eduard Steinke.



An opulent machine park.



Fischer GmbH & Co. KG



Helmut Fischer, Head of Toolmaking

Mr Fischer, how is your company doing businesswise?

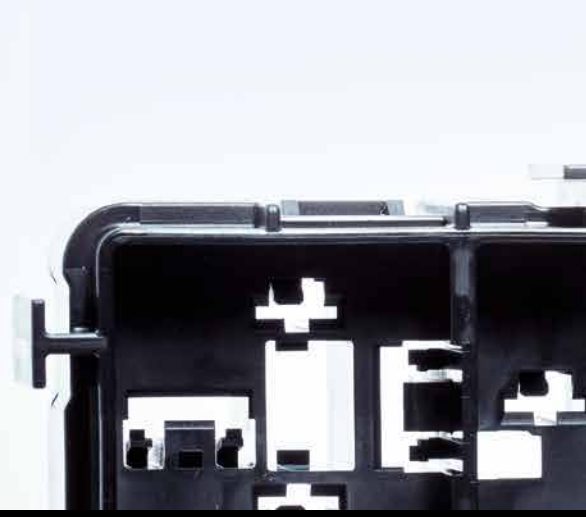
Fischer: Without mentioning sales figures, we're doing well economically and currently employ about 240 people. The order situation is good; firstly because we are quite broadly positioned in terms of target groups, and secondly because we manufacture our customers' products here in Sinsheim on their behalf. We not only have the full range of expertise in-house, but also the technical prerequisites for toolmaking, production and assembly. And we've invested a great deal in the expansion of this capacity in recent years.

What machines does your company have?

Fischer: In assembly, we finish, combine and install components on various assembly machines and systems using a variety of technologies, such as reel-to-reel processes, inline moulding, ultrasonic welding and so forth. In production we operate 70 injection moulding machines. This is where most of the preliminary products for these components are produced. In the toolshop, where the tools and moulds for these injection mouldings are produced, we have five wire EDM systems in addition to various CNC-controlled machining centres.

Two of these machines are from Mitsubishi Electric. When and why did you choose them?

Oehmig: About five years ago, for a variety of reasons, we urgently had to expand our wire EDM machining capacity. So we searched the market to see which supplier had the machine that would best meet our requirements. And that was Mitsubishi Electric. We bought the first wire EDM machine, type MV2400R, in 2015. We were absolutely delighted with its performance and precision. And this is why, a year later, the second machine was added, an MP1200.



20 years of wire EDM expertise.

Which sources of information did you rely on?

Fischer: We mainly looked around at metalworking trade fairs. In principle all well-known manufacturers are represented there with their machines and there you can get the best information. In more than 20 years we have acquired a lot of expertise in wire EDM. We know what we're looking for.

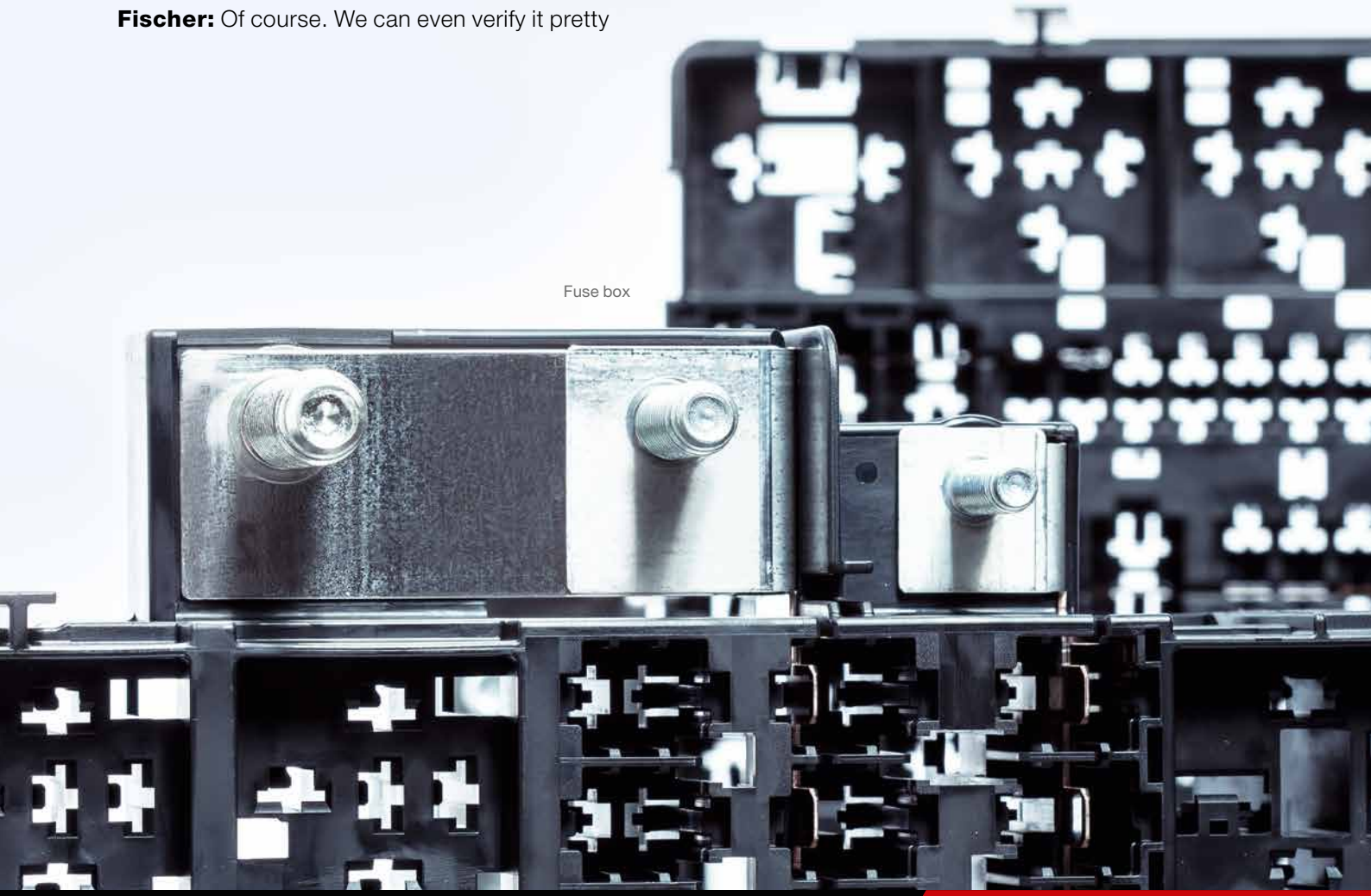
Which requirements did you focus on in choosing the machines?

Fischer: The decisive factors for us were above all an optimum price/performance ratio, ease of operation and rapid service – should we ever need it. And so far, I really have to say we've taken the right decision.

Toolmaker Eduard Steinke aligning the tool

When you talk about performance, do you mean the specific speed of machining during cutting?

Fischer: Of course. We can even verify it pretty



Fuse box

accurately: depending on the complexity of a component and the machining parameters, the cutting speed of Mitsubishi Electric machines is higher than that of other suppliers. However, taking the entire range of products that we have so far cut on these machines into account, this value is not quite as high. Nevertheless, there is a very nice side effect: compared to our old machines, we save up to 30 % of the energy otherwise required during machining.

Steinke: For me as a toolmaker, there is another aspect that is very important when it comes to performance: how easily a machine can be retooled when an order is changed. Retooling is unproductive downtime that should be kept as short as possible so that the machine is up and running again as soon as possible. And retooling on both Mitsubishi Electric machines is really quick.

How high is their load factor?

Fischer: That depends on the complexity of the parts being cut. The good thing is that you can cut those whose machining is very time-consuming overnight or over the weekend. All we have to do is make sure there's enough wire for cutting.

And what do you do if the wire breaks?

Oehmig: This is where Mitsubishi Electric has improved its automatic wire threader. It works brilliantly.

What materials other than tool steels do you cut on your Mitsubishi Electric machines?

Fischer: From tool steel we mainly cut the functional elements typical of injection moulds such as dies, mould inserts, punches and so on. Less often, we also cut copper and aluminium parts.

Let's come back to your EDM expertise. Did you still have to complete a training course at Mitsubishi Electric?

Oehmig: Yes, we attended a one-week practical seminar in Eisenach in 2015 and that made a lot of sense. Even though we knew the technology and the processes, we still had to learn how to use the new control system so that we can make best use of its functions and to their full extent.

Another factor you mentioned is rapid service. Have you ever

Shape-imparting elements of a mould

Automatic wire threading? Brilliant!

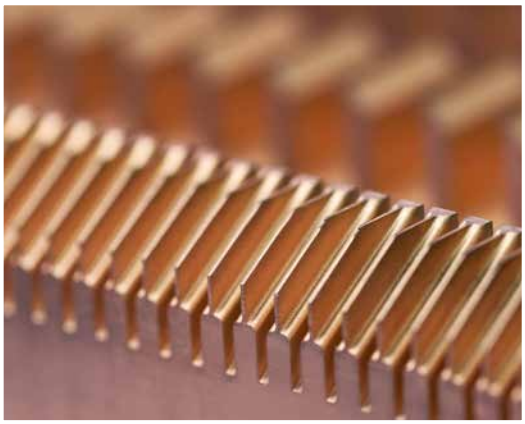
had to resort to it?

Oehmig: Not really. We carry out regular maintenance work ourselves. And if I remember correctly, in all the years we've only had one issue, and we were able to settle it over the phone.

If called upon due to the order situation, would you buy another wire EDM machine?

Fischer: We are currently actually considering whether to purchase another machine; ideally one with a rotary table as an additional axis. There is, for example, the KfW Energy Efficiency Programme, under which investments in energy-efficient production facilities and processes are financially assisted with an extremely low-interest loan.

Eduard Steinke and Helmut Fischer discussing the results of their work



Wire-cut electrode with thin webs, clamped at an angle of 32°

Fischer GmbH & Co. KG

Employees
240

Founding year
1973

Managers
Werner and Karin Fischer

Core business
Technical injection mouldings and assembly parts

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Horoscope

for hard-wired EDM experts.

Capricorn

21 December – 20 January

Resistance to wear is important not only for your workpieces – so pay more attention to your appearance. You don't want your colleagues to accidentally mistake you for a blank waiting to be machined. Every Capricorn should be born with a steel will – awaken it before it's completely buried in dropouts!

Aquarius

21 January – 19 February

The trine between Mars and its ascendant is currently restricted. You will feel a little insecure in the current situation. So give your life a combined flush – this is the only way to maintain your health and find the time to achieve your personal batch size.

Pisces

20 February – 20 March

With good ideas and persuasive arguments, your cutting performance will soon be a length ahead of your colleagues'. You're full of energy and drive. Your partner also benefits from this. The stars of romance haven't been as exciting and promising for a long time. The sparks fly and you're in heaven!

Aries

20 March – 20 April

You should pay more attention to the electrodes during die-sinking EDM – these are under the strong influence of Neptune. So as not to risk any deviations in the centre offset, you should definitely drink moonlight-harvested chamomile tea during the eroding process. This way you can swiftly assuage ice giant Neptune.

Taurus

21 April – 21 May

The planetary constellation in July meets your professional needs. You can easily hold your own with the world's best wire cutters and attract a constant stream of new jobs. To stay on track here, however, you should not ignore your private life. Smoothing the rough edges here is just as important.

Gemini

22 May – 21 June

Everything is going perfectly for you in the company, and your machining speed and quality of finish are legendary. But keep your feet firmly on the ground, even if your company helicopter is already ready to take you to your next job site. If the worst comes to the worst, you may have to cold-roll your ego so as not to lose traction.

It's written in the stars. And you can read it here ...

Cancer

22 June – 22 July

In a night of the full moon, you dream of a floating drive for EDM systems. In the course of the week, this sensation of floating spreads to almost all areas of your life; even the shopping bags now weigh only a fraction. With the additional momentum, you will finally be able to complete projects that have been long overdue.

Leo

23 July – 23 August

Your future persona will pay you a visit and provide the essential suggestions for THE gold eroding idea of your life. Whatever it is – be it an eroded tea strainer or carbon boots with a designer laser finish – don't let others put you off.

Virgo

24 August – 23 September

Transiting Jupiter is in the square of Venus. Unpleasant memories are trying to dominate your mind again. Simply brush these thoughts aside and take a few days off with your die-sinking machine. A surprise awaits you at your holiday destination, giving you the necessary impetus for the coming weeks.

Libra

24 September – 23 October

Your knowledge of planetary programmes will benefit your horoscope, and you display your mastery with corners and intricate contours. With such basic prerequisites, you can achieve the otherwise impossible and your own verve will guide you reliably to your goal in the coming days without any cogging torque or wear – inspired by the Tubular Direct Drive.

Scorpio

24 October – 22 November

Make use of your cosmic energy and that of Pluto and Saturn. The latter is currently reviving your spirits, so take the opportunity to eliminate the drop-outs from your life. How about another short break or a wellness weekend? This not only recharges your batteries, but also sharpens your grey cells for further concentrated work on your workpieces.

Sagittarius

23 November – 21 December

One of Neptune's moons is affecting your sign, so you don't know when you might be surprised. Be prepared and order all consumables in sufficient quantities! This gives your mind and your company the necessary process stability to soundly cope with even this interstellar roughness.

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Then write to us!

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