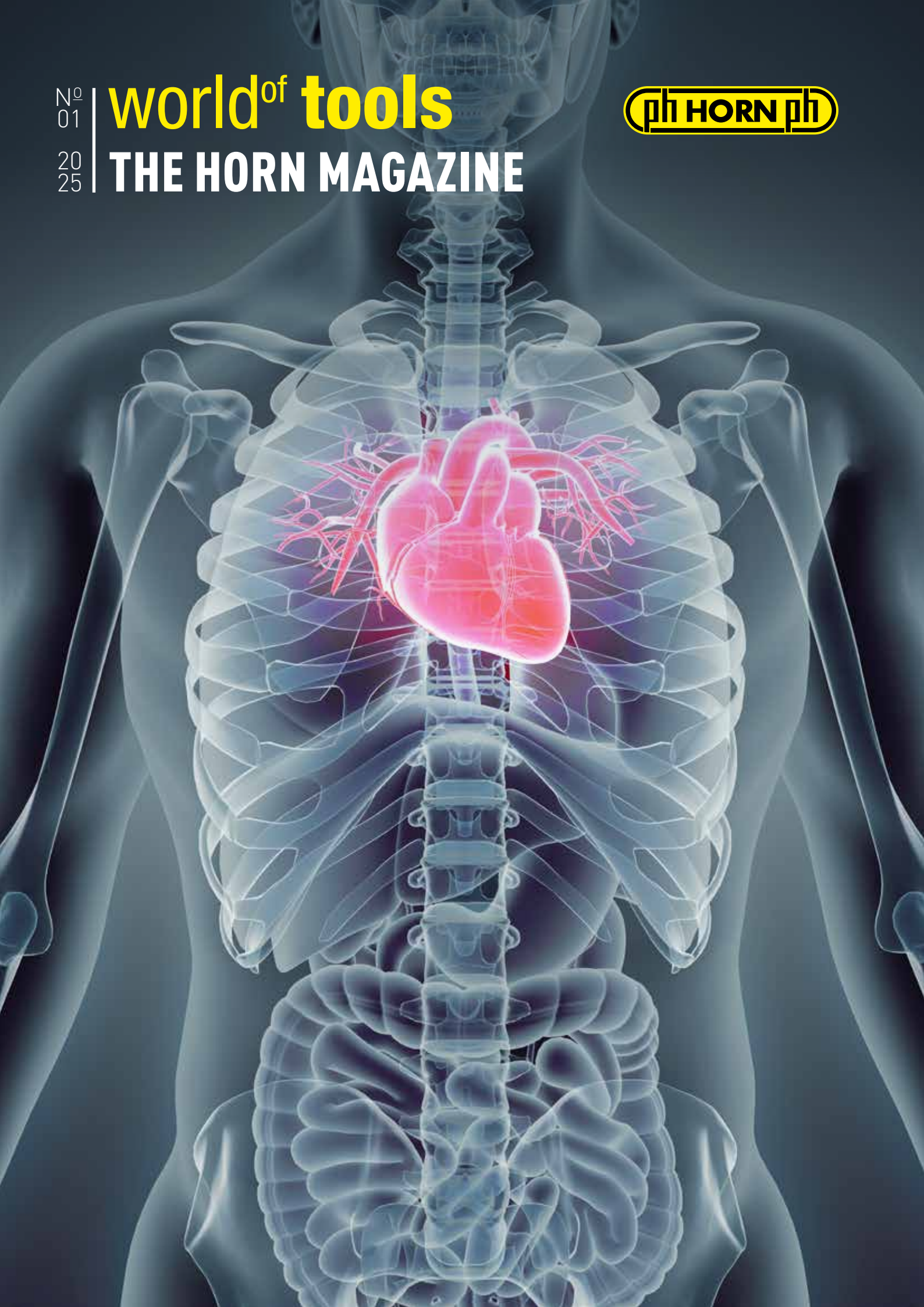
№ 01 | 2025

world of tools

THE HORN MAGAZINE



LADIES AND GENTLEMEN,

Boring, circular milling, groove turning and slot broaching, as well as high-polish milling and turning. The user reports in this issue provide a broad overview of our tool solutions. In addition, various customer industries are covered: medical, food and fittings. We are pleased to demonstrate our expertise with both standard tools and special solutions based on customer applications.

In 2025, our Italian partner, Febametal, celebrates its 30th anniversary. It is a partnership that has existed since the company was founded. The insights into the history and future of Febametal are rounded off by two user reports from Italy. The first deals with components for pasta machines. The second report focusses on the manufacture of heart valve implants. Both topics are extremely exciting and we encounter them more often in everyday life than we realise.

2025 is also the year in which we are once again organising our HORN Technology Days. Open production, specialist presentations, conversation with experts, numerous exhibits: the event, which takes place every two years, offers numerous reasons to take part and experience HORN.

We wish you exciting insights into the world of HORN in this issue of world of tools.

Markus Horn and Matthias Rommel, Managing Directors of Paul Horn GmbH

world of tools
№ 01 2025

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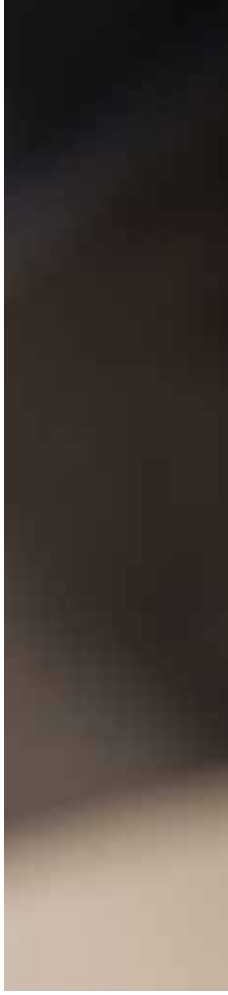
SPECIAL FEATURE

CHIPPING PROBLEMS SOLVED



"Our machining problems were solved after the first component," says Hakan Oda, talking about the new HORN Supermini with sintered geometry. Oda and his colleagues are responsible for tooling in the machining department at Endress+Hauser. The metrology company was one of the users that was able to test the new Supermini in field trials. The field tests were the first milestones in HORN's progress. "We could hardly wait for the market launch, as the tools have brought us many advantages," says Oda.

HORN provided the Endress+Hauser team with six Superminis with sintered chip breaking geometry for the tests. Customers are selected for field trials according to certain preconditions. "We know our users and their machining problems. The choice quickly fell to Endress+Hauser," says HORN application engineer Stefan Minder. In the metalcutting processes at Endress+Hauser, the team mainly machines materials such as 1.4404 (X2CrNiMo17-12-2), 1.4435 (X2CrNiMo18-14-3) and Hastelloy (2.4819, NiMo16Cr15W).

Chipping problems

The materials to be machined have numerous advantages for use in metrology. They include, for example, corrosion resistance or acid resistance. For economical machining, however, the materials require a great deal of expertise on the part of the user. This applies in particular to the series production of large quantities. Especially when turning smaller diameters, the problem arises of long, tangled chips that wrap around the tool like a bird's nest. This significantly limits process reliability and, in the worst case, leads to tool breakage. At Endress+Hauser, a stop had to be programmed after every fifth part in the automated production of M-forks to manually free the tangled swarf from the tool. The swarf also impaired in-process measurement and the gripping actions of the robot in the machining cell.

WE KNOW OUR USERS AND ARE FAMILIAR WITH THEIR MACHINING PROBLEMS.

A Supermini without chip breaking geometry was previously used. "The problem of long swarf can only be solved with chip breaking geometry. Regardless of the quality of the tool, this problem always exists," says Minder. The Endress+Hauser team was already impressed after the first trial with the new Supermini with sintered geometry. "Our problems were literally solved at the push of a button. The swarf from internal turning was no longer tangled, but short, curled chips," says Oda. The team kept the cutting parameters the same as with the previous tool. Minder and the Endress+Hauser team tested the tools on various machines and components for a total of four weeks. The tool showed its potential in

The new Supermini with sintered geometry solved the chip breaking problems.

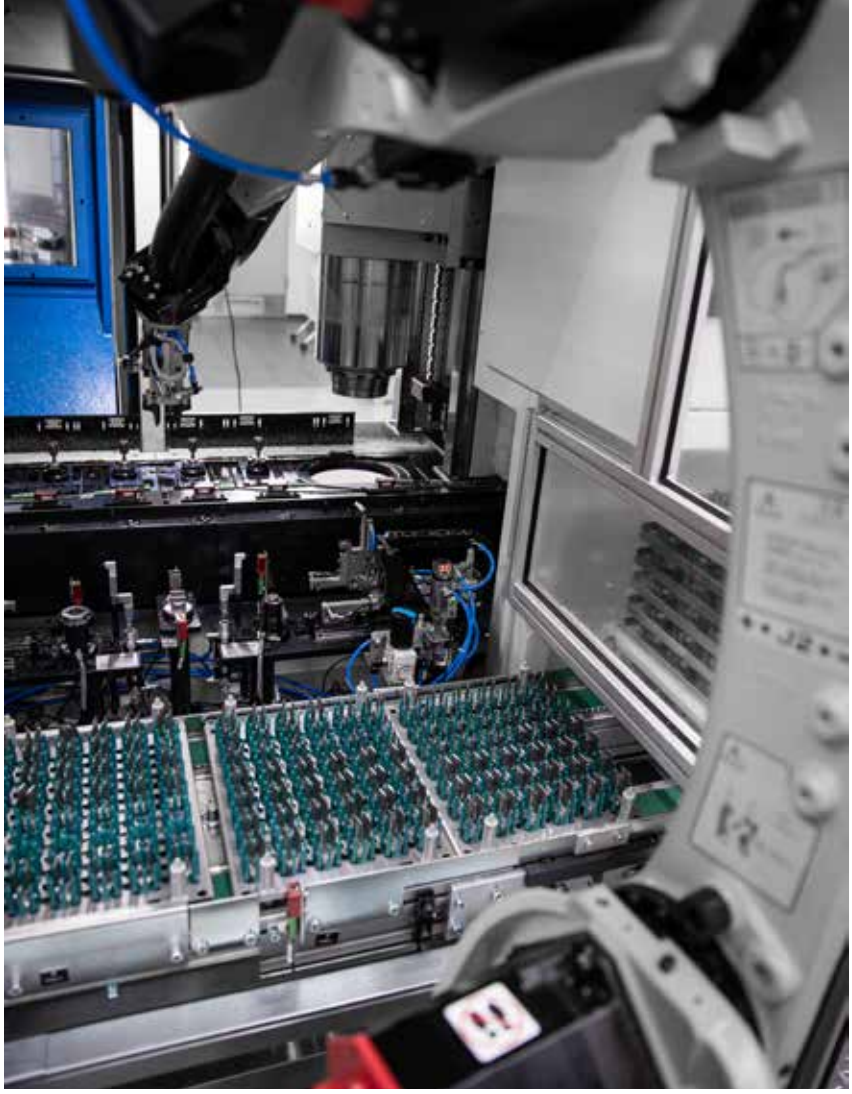
The M fork is used in level indicators.

all processes. "We would have liked to order more tools straight away, but we had to wait for the official market launch," says Oda.

Long development time

"We have been working intensively on the development of the new Superminis for over four years," said HORN CEO Matthias Rommel at the press conference held to launch the new tool in June 2024. Chip breaking geometry can help to avoid long tangled chips. It guides and shapes the chip and causes it to snap off. Previously, specially lasered or ground chip breaker geometries were used for this purpose. However, this was associated with increased cost of the inserts. With the new type 105 Supermini, HORN has succeeded in developing a universal boring tool with sintered chip breaking geometry. The tool offers high process reliability due to good chip control. The cutting geometry extends far into the corner radius of the insert. This ensures chip control even at low infeed settings. The geometry can be used universally for different material groups and is suitable for internal, face, copy and reverse turning.

In addition to the geometry, HORN has also optimised the carbide blanks of the inserts to have greater rigidity and an even more stable cutting edge. The coolant supply has also been revised. The new insert is compatible with numerous type 105 clamps. HORN offers the inserts in three lengths (15.0 mm (0.079"), 20.0 mm (0.157") and 25.0 mm (0.394")) and in carbide grade IG35 as standard. The corner radius



Bird's nests of swarf restricted automated production and led to regular machine stoppages.

is 0.2 mm (0.008"). Tool diameter is from 6 mm (0.236"). The wide range of applications of the inserts is also reflected in their cost-effectiveness. The cost of the new Superminis is similar to that of the standard insert without geometry.

Appropriate tool holders

Users can choose the appropriate solution for their machining from a wide range of different types of tool holder. These include round shank holders, square shank holders, interface tool holders and adjustable holders to suit machines from different manufacturers. HORN offers four different solutions for clamping the inserts: Classic screw clamping via a ball pressure screw, clamping via a face clamping element and clamping via a lifting element. For confined spaces, HORN also has in its programme a slim holder system with clamping via a union nut.

THE WIDE RANGE OF APPLICATIONS FOR THE INSERTS IS ALSO REFLECTED IN THEIR COST-EFFECTIVENESS.

Endress+Hauser uses a tool holder with a polygonal shaft and face clamping element for the fully automated production of M forks. These play an important role in measuring equipment. They are used for measuring the level of a liquid. The forks resemble a tuning fork. During operation, they vibrate at a certain frequency. When the fill level in a tank rises and the forks are immersed in the liquid, the frequency of the vibrations changes due to the density of the medium. The sensor thus registers when the fill level has been reached.

A successful collaboration: Stefan Minder and Hakan Oda.

Leading worldwide

Endress+Hauser is a leading worldwide supplier of measuring instruments, services and solutions for industrial process engineering. The company offers process solutions for flow, level, pressure and temperature measurement, for analytical measurements, as well as for data recording and digital communication, thereby optimising processes in terms of economy, safety and environmental impact. Endress+Hauser's customers operate in a wide range of industries such as chemicals, energy and power plants, raw materials, metals and mining, food, life sciences, oil and gas, and water/wastewater.

Endress+Hauser and HORN have been working together for decades. "The new tool has shown us once again why we rely on tools from HORN in our production. In addition to the high level of process reliability, we were able to reduce non-productive times and also increase the service life of the tools," says Oda.

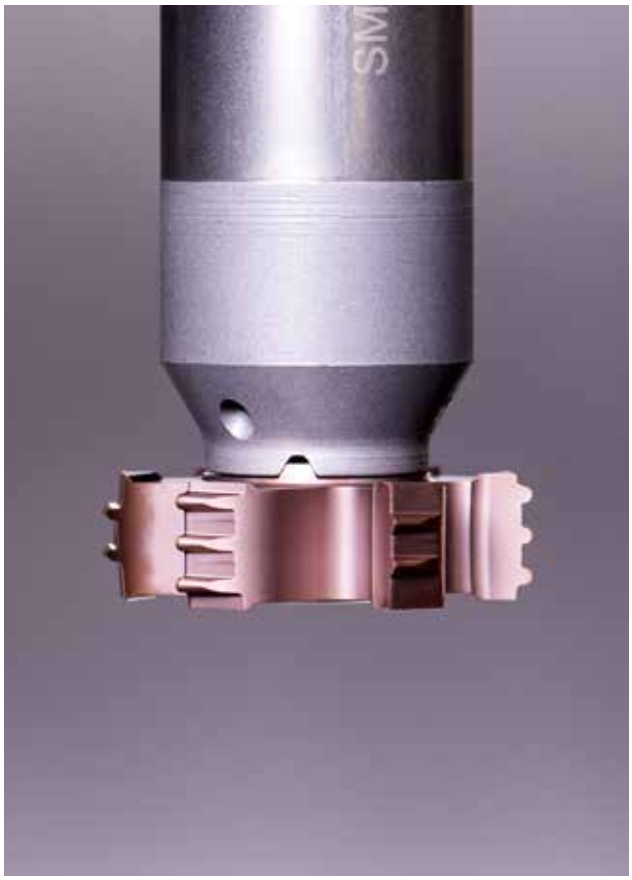
HORN Supermini

Boring, profile turning, internal grooving, threading, chamfering, face grooving, drilling and slot broaching: The Supermini tool system can be adapted and used for numerous machining operations. The solid carbide inserts are used for boring internal diameters from 0.2 mm (0.008") to around 10 mm (0.394"). HORN developed the carbide blanks of the tool as a teardrop shape. This enables precise and large contact surfaces in the tool holder, which results in greater rigidity of the overall system. Furthermore, the teardrop shape prevents the insert from twisting, which leads to a consistently precise positioning of the centre height of the tool. For long tool overhangs, it reduces deflection and minimises vibration during the turning process. Depending on the application and the diameter to be machined, HORN offers the inserts in three different sizes (types 105, 109 and 110) and various blank types. All variants allow for internal coolant supply directly to the cutting zone. The HORN tool portfolio contains around 2,500 different standard variants of the Supermini. In addition, HORN solves users' tasks with countless customised solutions.

SPECIAL FEATURE

SPECIALITIES FROM THE WORLD CENTRE

Götz machines fillets using an end mill with a solid carbide insert.



Profile for milling the handle pattern.

Maranello is famous for its red sports cars and Geneva is the Mecca for watch enthusiasts – but the products from Tuttlingen are usually only known to specialists. Over 400 companies produce world-renowned instruments and devices in the global centre of the medical industry. Tweezers, implants and endoscopes: the expertise in the medical industry has grown over time and is passed down from one generation to the next. The company HG-Micro-Instrumente GmbH & Co. KG from Wurmlingen, near Tuttlingen, is one of these specialists. The team, led by managing director and production manager Christoph Götz, produces forceps, ear tweezers and other medical instruments. In addition to skilled manual work, the company relies on modern CNC machining centres and tool systems. For milling tweezers, HG-Micro-Instrumente GmbH & Co. KG uses tool systems from Paul Horn GmbH and hydraulic chucks from Schunk.

No chatter marks: Despite the long overhang, the system achieves a high level of vibration damping.

"We once had a complaint because the forceps were four grams too light," jokes Christoph Götz as he talks about his experience and continues: "Almost everything is certified when it comes to surgical instruments. Even the slightest deviation from the target parameters is not acceptable, even if tweezers are made of titanium to reduce weight." Tolerances of a few microns are the order of the day in the production of medical instruments. HG-Micro-Instrumente GmbH & Co. KG produces the products on a contract basis for the big players in the medical industry according to drawings and customer requirements. 90 per cent of the instruments are titanium. "We process steels such as 1.4021 into ear tweezers," explains Götz.

Quality was not good enough

The carbide blanks for the tweezers arrive as turned parts. Götz and his team use a Hermle C22U machining centre to produce both halves of the tweezers from carbide blanks. The two halves are laser welded together in a subsequent process. "We used to buy in the halves already machined. However, the quality was no longer good enough for us. We were also inconvenienced by the long delivery times," says Götz. The company therefore switched the production processes to complete machining. To do this, Götz looked for an appropriate tool solution. It was not just the insert that was important, but the entire system from the insert to the spindle interface. Due to the sometimes long tool overhang and the high surface finish required, the tool system must be vibration-damped to avoid chatter marks.

Together with HORN applications engineer Stefan Minder, Götz found the appropriate tool solution with HORN's circular interpolation milling system. The milling system performs three important processes: milling the hollow groove, milling the gear teeth of the tweezer tip and milling the handle pattern for flat-handled tweezers. A six-edged type 632 full-radius insert is used for milling the chamfer, which serves to reduce weight. The tool has a diameter of 30 mm (1.181") and mills the 3 mm (0.118") deep chamfer in two cuts. "The tool demonstrated high milling performance right from the start. We just had to tweak the machining parameters a little here and there to achieve the best possible surface quality," says Minder.

Cut distribution

A type 628 insert with six cutting edges is used for milling the handle pattern and the serrations of the tweezer tip. The individual insert edges are ground offset to each other. The six-edged insert therefore acts like a three-edged insert during the milling process. The advantage of this cut distribution is that fine serrations, for example, can be milled without high cutting pressure. The fine serrations must be present on the tweezer tip. In one milling pass, the 7 mm wide insert mills 17 teeth to a depth of 0.35 mm. In addition, the milled serrations must be highly precise. In use, the serrations on the two halves of the tweezers must mesh precisely. This principle of cut distribution is also used when milling the handle pattern.

EVEN THE SLIGHTEST DEVIATION FROM THE TARGET PARAMETERS IS CONSIDERED UNACCEPTABLE.

The optimised cutting edge geometry in conjunction with the IG35 coating ensures high productivity and process reliability when machining titanium. With a coating thickness of just 0.003 mm (0.0001") and a maximum operating temperature of around 1,100 degrees Celsius (2,012 degrees Fahrenheit), the tool achieves on average twice the service life of conventional coatings. HORN coats the tools in-house in its own HiPIMS coating systems. In addition to high cutting performance, this enables fast delivery of the tools.

HORN circular interpolation milling system

HORN's circular interpolation milling system offers the user a number of advantages: It is fast, reliable and achieves good surface results. The tool, which is guided on a helical path, plunges into the material either at a steep or a very shallow angle. It allows high-quality threads, for example, to be produced reproducibly. Compared to machining larger diameters with indexable inserts or smaller diameters with solid carbide milling cutters, circular milling cutters are generally more economical. They have a wide range of applications, including machining steel, special steels, titanium, aluminium and special alloys. The precision tools are particularly suitable for slot milling, helical milling, thread milling, T-slot milling, profile milling and gear milling. However, they are also highly effective in special applications such as milling sealing grooves or connecting rod machining.

THE PRINCIPLE OF CUT DISTRIBUTION IS USED WHEN MILLING THE HANDLE PATTERNS.

The tool mills 17 teeth in one pass for cutting the serrations of the tweezer tip.

The production of surgical tweezers is precision work.

Together they found the appropriate solution for the milling process: Stefan Minder in conversation with Christoph Götz.

Stable overall system

Götz relies on the Schunk TENDO hydraulic clamping system for securing the milling tool. TENDO has been a byword for precise clamping of shank tools for decades. Thanks to continuous further development, this pioneering clamping technology meets the constantly increasing requirements of demanding, universal precision machining. TENDO is suitable for all common shank types. The wide range of products offers the appropriate solution for almost every application. The runout and repeatability of the clamping system is around 0.003 mm (0.0001"). The excellent vibration damping is particularly advantageous with long tool overhangs.

The combination of the insert, solid carbide tool shank and hydraulic chuck performs well in HG-Micro-Instrumente applications. "We have mastered the milling process and are very satisfied with the result. Furthermore, HORN's service and technical advice are of a very high standard," says Götz.

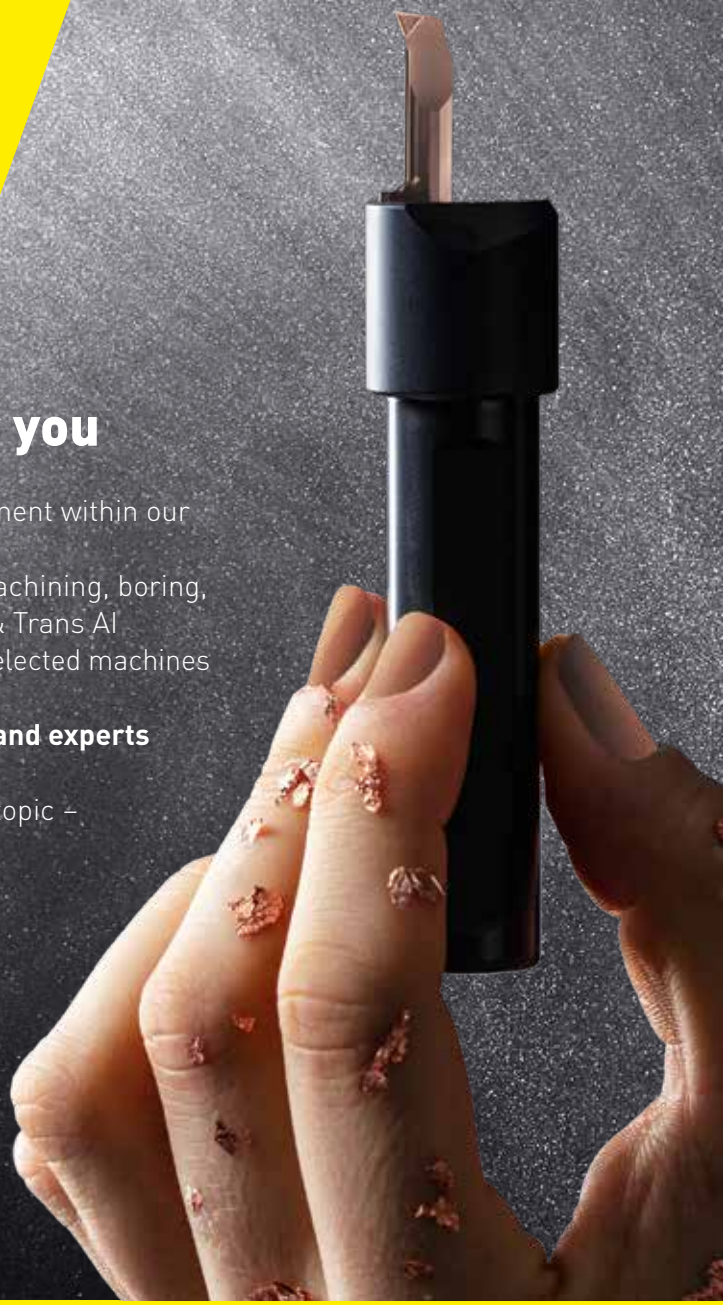
HG-Micro-Instrumente GmbH & Co. KG

For over three decades, HG-Micro-Instrumente GmbH & Co. KG has been dedicated to the manufacture of high-quality surgical instruments, which are 100 per cent manufactured in Wurmlingen. A family-owned company, HG-Micro-Instrumente GmbH & Co. KG focuses on high quality, flexibility and reliability in every phase of production. Its expertise lies not only in the manufacture of surgical instruments, but also in CNC contract machining, where the team develops customised solutions for its customers. The company always strives to achieve a high level of customer satisfaction and makes no compromises when fulfilling exacting production requirements.

HORN TECHNOLOGY DAYS

TECHNOLOGY DAYS 14TH TO 16TH MAY 2025

EXPLORE



We are opening our doors for you

- Exceptional **insights** and maximum freedom of movement within our production facilities
- **Presentations on the following topics:** Aluminium machining, boring, product configuration, turn-milling, grooving, HORN & Trans AI
- **Live machining** and exciting **Live demonstrations** on selected machines
- Impressive **exhibits**
- Conversations at the highest level with our **speakers and experts** as well as numerous **partner companies**
- **Special exhibition** by HORN Hartstoffe GMBH on the topic – from powder to the finished blank
- **Final presentation** of the German Federal Ministry of Education and Research projects **Trans AI and MetaLearn**, together with HORN (Thursday 15th May 2025 – German language only)

Visit Tübingen and explore HORN!

Opening hours:
Wednesday and Thursday from 08:00 to 17:00
Friday from 08:00 to 15.00

Detailed information can be found at:
horn-technologydays.com

INTERVIEW

CONVERSATION WITH ANDREA HORN

Mrs Horn, how is the HORN Academy structured?
The HORN Academy is a separate division within Paul Horn GmbH. Our educational institution consists of five pillars: Apprenticeships, further training, studies, retraining and customer seminars. Our philosophy at HORN is that the success of a company depends to a large extent on the expertise of its employees. Training and further education play a central role today in times of a shortage of skilled labour, and this is precisely where we see our responsibility. I myself am responsible for the areas of further training, customer seminars and also for our HORN Technology Days.

What is the focus of the customer seminars and how often do they take place?
In our technology seminars, we address common topics relating to machining and convey complex content in an understandable and practical way. When designing the content, we focus primarily on our customers - practical and user-centred. The training programme is divided into a theoretical and a practical part. The seminars usually take place twice a year, once in spring and once in autumn.

What are the objectives of the internal programmes?
Anyone who works to a thousandth of a millimetre every day must not only be particularly well qualified, but also particularly well motivated. That is why we at HORN attach great importance to the quality of the training and further education of our trainees and employees. After all, knowledge and experience are indispensable prerequisites for mastering state-of-the-art technologies. As part of our in-house HORN Academy, we are able to adapt the qualifications of our employees to the current requirements of the industry. The result is an internal further training catalogue that is updated and expanded every six months as required.

How is your team organised?
There are four of us in the team. They have a structured division of tasks: Customer seminars and the further training catalogue for our internal use. My team also organises the HORN Technology Days - together with many other helping hands from a wide range of departments, of course. The pillars of apprenticeships, retraining and studies are also located in our training centre. The team consists of the head of apprenticeships, three trainers and two practical trainers.

HORN Akademie

Andrea Horn is responsible for training, customer seminars and technology days at the HORN Academy.

What does the internal training catalogue contain?
Our internal further training catalogue focuses on communication and management, health, product training, IT training and sport and fitness. All topics are further divided into specific training courses. In addition, targeted training courses and further education are also offered on request, covering topics beyond these core areas.

When will the next Technology Days take place and what can visitors expect from the next event?
The upcoming Technology Days will take place from 14th to 16th May 2025. Over three identical days, visitors can expect targeted specialist presentations and practical demonstrations, open production and one-to-one discussions. A large number of partner companies and exhibits round off the programme. Catering will be provided. In addition, there will once again be a specialist lecture and a display of a funding project with a partner from industry and research on the topics of TransKI and MetaLearn.

What distinguishes the HORN Technology Days from other in-house exhibitions?
In my opinion, it's not just the programme that sets the HORN Technology Days apart, but primarily the open and accessible production facilities. Insert production and the areas of tool holders, coating, fixture manufacture and additive manufacturing are particular highlights. During the event, production continues as usual and you can look over the shoulders of one or two colleagues and gain exclusive insights.

AT HORN, WE ATTACH GREAT IMPORTANCE TO THE QUALITY OF TRAINING AND FURTHER EDUCATION.

What are you personally looking forward to most at this event?
A visitor survey was conducted after the 2023 Technology Days, which led us to implement some changes for the 2025 event. I'm really looking forward to seeing how the new elements, such as the in-depth specialist presentations, are received and evaluated. Of course, I am most looking forward to seeing our visitors themselves. After all, they are the ones who make the event, what it is.

More information at:
www.horn-akademie.de
www.horn-technologydays.com

PRODUCTS

HIGH AXIAL GROOVING DEPTHS

The new Mini 114 system from HORN enables a face grooving depth of up to 10 mm (0.394"). The Tübingen-based tool manufacturer is thus further expanding the already wide variety of this product family. The insert is suitable for turning and copy turning of axial grooves. The user does not need a special tool holder, as the insert is compatible with the existing axial holder system. As standard, HORN offers the EG55 carbide grade grooving tools in three different types from stock with cutting widths of 2 mm (0.079"), 2.5 mm (0.098") and 3 mm (0.118"). The minimum diameter for grooving is 14 mm (0.551"), while the maximum is 34 mm (1.339") to 36 mm (1.417"), depending on the type.

The face-screwed inserts of the Mini system are one of HORN's core products. The tool system is suitable for turning and milling applications. The precision tools have proven particularly effective for boring, internal grooving and face grooving. Paired with the low-vibration carbide tool holders, the inserts produce good surface finish even with long overhangs and ensure excellent process reliability. The Mini system's broad portfolio offers inserts in various sizes for different internal diameters as well as different geometries and substrates and CBN or diamond tips.

PRODUCTS

ONE INTERFACE – MANY POSSIBILITIES

One interface – many possibilities

HORN is expanding the modular grooving system specifically for use in INDEX multi-spindle lathes. The special interfaces enable short set-up times, making them suitable for small series production. The tool system is available in various sizes for the different machining stations. HORN offers a special synchronised swivel spindle for economical back end machining. Numerous tool holders of the modular system can be easily adapted to the INDEX interface.

Thanks to its precision and rigidity, HORN's modular grooving system is highly flexible when it comes to adapting it to different machine types. Standardised modules bridge several interfaces. The modular system kit has a selection of toolholders for turrets and other interfaces based on common machine types. The appropriate grooving holders with internal coolant delivery allow the cassettes to be adjusted in height and clamped in a normal or overhead position, on the left or right of the holder. Height-adjustable tool holders are available for multi-spindle lathes, onto which the cassettes are screwed directly. The cassettes are used to hold numerous HORN grooving insert systems. Parting off, grooving, sliding-head turning: The modular system can be flexibly adapted to the application.

THE MODULAR SYSTEM CAN BE FLEXIBLY ADAPTED TO THE APPLICATION.

EFFICIENT BORING OF STAINLESS STEELS

Efficient boring of stainless steels

HORN has added a new variant to the Supermini system especially for boring stainless steels. The optimised cutting geometry combined with the IG35 coating ensure high productivity and process reliability. With a coating thickness of just 0.003 mm (0.0001") and a maximum operating temperature of around 1,100 degrees Celsius (2012 degrees Fahrenheit), the tool achieves on average twice the life of a conventionally coated tool. HORN coats the tools in-house in its own HiPIMS coating systems. This enables not only high cutting performance but also fast delivery of the tools.

Boring, profile turning, internal grooving, threading, chamfering, face grooving, drilling and slot broaching: The Supermini tool system can be adapted and used for numerous machining operations. The solid carbide inserts are used for machining bores with diameters from 0.2 mm (0.008") to around 10 mm (0.394"). HORN developed the carbide blanks of the tool as a teardrop shape. This enables precise and large contact surfaces in the tool holder, which results in greater rigidity of the overall system. Furthermore, the teardrop shape prevents the insert from twisting, which leads to consistently precise positioning of the centre height of the tool. For long tool overhangs, it reduces deflection and minimises vibration during the turning process. Depending on the application and the diameter to be machined, HORN offers the inserts in three different sizes (types 105, 109 and 110) and various blank types. All variants allow for internal coolant supply directly to the cutting zone. The HORN tool portfolio contains around 2,500 different standard variants of the Supermini. In addition, HORN has solved users' problems with countless customised solutions.

ALL TYPES ALLOW FOR INTERNAL COOLANT SUPPLY DIRECTLY TO THE CUTTING ZONE.

HIGH SURFACE QUALITY AT HIGH SPEED

THE RELIABLE MACHINING OF THESE PROBLEMATIC MATERIALS REQUIRES A HIGH LEVEL OF EXPERTISE ON THE PART OF THE USER.

High surface quality at high speed

Nickel-based alloys, titanium, cobalt-chrome: Reliable machining of these problematic materials requires a high level of expertise on the part of the user. If the workpieces also require high surface quality, the use of specialised tools is essential. HORN addresses this need with a CBN tool system that is unique on the market. Geometries specially developed for finishing ensure high surface quality, tight tolerances and high process reliability when machining the material groups P, K and S. Moreover, HORN is pushing the boundaries of machining speed with this system.

In operation, the tools achieve speeds of 350 m/min (1,148 ft/min) when cutting Inconel and 300 m/min (984 ft/min) when cutting titanium alloys, for example. The tools produce surfaces with an almost mirror-like finish. The combination of cutting material, quality of the tool edge grinding, coating and coolant supply enables the high performance. The reliable process is enhanced by the linear wear behaviour of the CBN cutting material. Wear rate is therefore predictable. The finishing system is available as standard in numerous HORN tool systems. In addition to various ISO inserts, HORN offers CBN inserts for the Supermini, Mini, 229 and 315 systems, as well as for the DTS milling system.

SOLID CARBIDE CIRCULAR MILLING CUTTER

Solid carbide circular milling cutter

Grooving, parting-off and threading: HORN's DC circular milling system is universally applicable to numerous milling operations. In contrast to indexable inserts, tools of the DC system have a solid carbide monoblock construction. The strengths of this design are evident, for example, in greater milling depth when grooving or when milling small internal threads. Comprising numerous variants, the system is a real problem solver for users. HORN is now adapting the tool system to meet increasing requirements.

HORN has established the carbide grades RC25 and RC45 as the new standard. They have proven themselves in practice as all-rounders. Furthermore, the optimised geometries ensure even higher milling performance. They include, for example, the customised micro-geometries of the cutting edges. HORN is rounding off the DC system with additional variants. The DCN type is expanding by 35 items. There are also intermediate sizes with diameters of 5 mm (0.197"), 7 mm (0.276"), 9 mm (0.354") and 11 mm (0.433"). All diameters are available for machining grooves from 0.5 mm (0.020") wide. The DCF and DCX series have also been updated with new variants.

WITH NUMEROUS VARIANTS, THE SYSTEM PROVES TO BE A PROBLEM SOLVER FOR USERS.

HORN WORLDWIDE: ITALY

FEBAMETAL. THE STORY

1978 The birth of a passion.

Paolo Costa, a young engineer with a degree from the Polytechnic University of Turin, is hired by the Italian subsidiary of a Swiss manufacturer of carbide tools, which also represents in Italy the grooving tools of a then small German company, HORN from Tübingen.

1994 A new idea.

The Swiss company is going through a difficult time and is about to be taken over by an American group. Paolo Costa is concerned that HORN tools will no longer find suitable distribution in the Italian market and develops the idea of resigning in order to devote himself mainly to the distribution of HORN tools in Italy. He discusses this with HORN's German management, specifically Export Manager Andreas Vollmer.

1994 A decisive meeting.

Paul Horn, his son Lothar Horn and Andreas Vollmer meet at the beginning of July. Paolo Costa confidently explains his projects for greater and better penetration of the Italian market. A handshake seals the agreement. Paolo Costa selects a young Italian application engineer, Stefano Villa, to help him with customer support.

1995 Two special people.

Paolo Costa suggested that Beatrice Curti and Franco Gazzarri participate in the founding of a new company. Curti was a former work colleague and Gazzarri had just retired. Costa's idea was a company based entirely on HORN products and a few other, no less valuable brands. Beatrice Curti has great management skills, a remarkable mastery of IT and a strong and warm human touch: she becomes the operations manager. Franco Gazzarri knows all the secrets of technology, does not shy away from problems of any kind and has expertise in handling even difficult projects in mechanical engineering: he takes over the technical management.

1995 Febametal.

On 12th April, the company Febametal srl (limited liability company) is founded with a notarial deed. The name is made up of the initials of Paolo's son and daughter: Federico and Barbara. The company is based in Turin, in a small office. Official activities begin on 2nd May.

1996 New premises.

Febametal is growing. The small office is no longer sufficient: More space is needed – for the offices, but also for tool storage. The new premises are located in Via Fattori, also in Turin.

1998 A new development.

Febametal is confidently continuing the distribution of HORN tools and consolidating the brand on the Italian scene. A new technician, Andrea Panichi, supports Stefano Villa in the sale of HORN products. A few years later, Antonio Cavalluzzi becomes the third technician dedicated to HORN products.

2001 The new plant in Grugliasco.

The premises in Via Fattori are no longer sufficient. Lothar Horn encourages Febametal to set up a small production unit in Italy specialising in the modification and manufacture of special grooving tools. Febametal moves to Via Grandi in Grugliasco, and buys and renovates an old industrial plant that houses a production workshop. Febametal is transformed from a limited liability company (srl) into a public limited company (spa) in order to be able to respond appropriately to the new challenges of the market.

2005 A new generation at Febametal.

Federico Costa, Paolo Costa's son, successfully completes his university studies and is employed by Febametal. Two years earlier, Luca Gazzarri, Franco Gazzarri's son, who had completed his engineering studies at the Polytechnic University of Turin, had already joined the company.

2006 The "Superminis" are coming.

In Germany, HORN experiences a period of strong growth and suffers from a lack of space. Lothar Horn approaches Febametal again and asks the Italian partners if they would be prepared to take on some machines for the production of Supermini system inserts at the Grugliasco plant. The following year, the Febametal workshop would be able to produce this type of insert in considerable quantities.

2017 Febametal continues the race.

The year 2017 brought Febametal continuous growth, especially with regard to HORN tools. The company is now recognised as a leader in Italy and is no longer just a niche player. Febametal's production workshop is developing accordingly: new grinding machines for the production of solid carbide rotary tools have arrived to support the distribution of HORN products to Italian customers.

2023 Federico Costa.

Federico Costa becomes General Manager at Febametal.

2025 A new, confident look into the future.

Federico Costa is preparing to take over the official and legal presidency of Febametal: Luca Gazzarri and Barbara Costa actively support him. At the beginning of 2024, Federico Costa is appointed President of ECTA (European Cutting Tool Association), a sign of the prestige that he and Febametal have achieved together in the world of tools.

HORN WORLDWIDE: ITALY

30 YEARS OF FEBAMETAL

BEATRICE CURTI, COO

Working at Febametal was a challenge, the most complicated and most fulfilling of my life. At the beginning, everything was new and we couldn't let anyone down; not Paul Horn, who put his trust in us; not our colleagues and certainly not our customers. The appreciation and loyalty shown to us by our customers and our colleagues helped us to be more active and attentive and to improve day by day in order to fulfil our role. I am proud to see Febametal grow and I am sure that the company will continue its growth thanks to the commitment and passion of everyone and, above all, thanks to the skills of the new management.

STEFANO VILLA, APPLICATION TECHNICAL ENGINEER

As a HORN application engineer, I started my journey 30 years ago and saw Febametal come to life. In the beginning it was a small company, but with the will and ideas to develop and pursue the goal of becoming a market leader, as is the case today in the cutting tool industry.

PAOLO COSTA, CEO

Among the many memories, one in particular has stayed with me: my first meeting with the official from the Italian bank when Febametal was founded in 1995. I wanted to ask the bank for a modest credit line. The official – to my great astonishment – tried to convince me that I should not even start my own business. Then, given my determination, he granted me what I asked for, but only in exchange for a countless list of guarantees, which I had to sign together with my wife Adelaide and my two partners Franco Gazzarri and Beatrice Curti. Quite different, much friendlier and certainly much more intelligent was the trust that Paul Horn and his son Lothar had placed in me a few days earlier. It happened without signatures, with a simple and sincere handshake, the warmth of which would accompany me in the years to come.

FRANCO GAZZARRI, SENIOR BOARD MEMBER

Two events that I like to remember fill me with satisfaction and pride. The first is the transition of Febametal from a limited liability company to a public limited company, as this was the result of the work of all the employees and, in particular, the result of the ambitious goals that the company's managers have always wanted to set themselves. The second reason is the generational change at the top of the company, which has taken place with the arrival of our sons, who have proven in a short time that they are able to fulfil their positions correctly, thus guaranteeing the continuity of the principles that have always inspired Febametal.

FEDERICO COSTA, GENERAL MANAGER
In the 30 years that Febametal has existed, I have been actively involved in this adventure for 20 of them. It's incredible to think how much has happened in that time. I am very much looking forward to leading Febametal into the future together with our great team.

LUCA GAZZARRI, TECHNICAL DIRECTOR
Today, the world of mechanical engineering and manufacturing is undergoing radical change under the influence of technological innovations and new environmental and health requirements. Against this backdrop, Febametal's future will increasingly depend on its ability to offer today's customers innovative and high-performance tools while breaking new ground. This is necessary in order to further expand the areas of production in which the company is competitive.

BARBARA COSTA, MARKETING MANAGER
Although part of me has always been involved since the company was founded, I've only been employed since 2021. I am primarily responsible for marketing and events. In future, I'll be taking on more commercial tasks and I'm looking forward to working even more closely with customers and the Italian market.

ANDREA PANICHI, APPLICATION TECHNICAL ENGINEER
I started working with Febametal 27 years ago as a HORN application engineer. At that time, the company was an outsider in the Italian tool industry. Today, we have grown into a top player.

ANTONIO CAVALLUZZI, APPLICATION TECHNICAL ENGINEER
It's now 20 years since I started at Febametal. Although I live in the south of Italy, the company always made sure that the geographical distance was irrelevant. The team was always there for me. I found a group of great professionals and, on a personal level, a family. Febametal has been fundamental to my professional development. I owe them a lot.

HORN WORLDWIDE: ITALY

DOLCE VITA

Italy is famous for its cuisine and authentic dishes, which are global favourites. Alongside pizza, it is the countless varieties of pasta that have conquered the world. No wonder that the machines used to make pasta also come from its home country. Imperia & Monferrina from Turin produces pasta machines that are found in factories, restaurants and households worldwide. "We have been working on the development of the perfect machine for almost 100 years," says Managing Director Enrico Ancona. For the production of the individual parts, the company relies on tool systems from Paul Horn GmbH and on technical advice from Febametal, the Italian representative of the German tool specialist.

The design of the classic pasta machine for the home kitchen has hardly changed since the 1950s. With the Imperia "Classica", the company set the standard for this type of machine. The principle is simple: the front rollers are used to press the pasta dough into a shallow, long sheet. The long sheet of dough is then moulded into the desired shape using an attachment. "The attachment is the heart of a pasta machine and where its quality is defined," says Ancona. Imperia also offers electric models for home and restaurant use. However, the basic principle remains the same.

THE DESIGN OF THE CLASSIC PASTA MACHINE FOR THE HOME KITCHEN HAS HARDLY CHANGED SINCE THE 1950S.

Professional machines

With the La Monferrina brand, the company produces machines for professional use. La Monferrina has been part of the Imperia world since 2010. Under this brand name, the company produces machines for professional use. The machines are capable of producing pasta in all shapes and sizes on a large scale and are sold worldwide. Depending on machine type, a machine may combine mixing and kneading of the dough with subsequent moulding. The machines can also fill and seal ravioli in a matter of seconds. Special moulds are used to shape the pasta. Similar to injection moulding, the dough is compacted by an increasingly narrow insert, then pressed through the die at high pressure and cut to the desired length. The pressure and the outlet/slot of the mould determine the shape of the pasta produced.

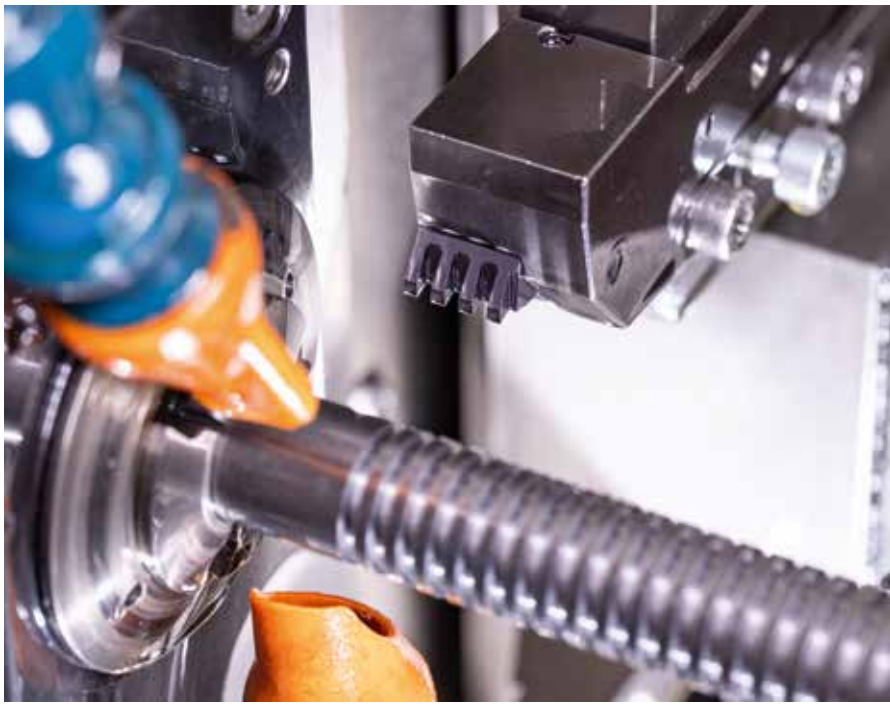
"The precision of the individual components is very important to us, otherwise the pasta machine won't work," explains Production Manager Federico Marchese. In addition to shaping, the moulding rollers cut the pasta dough. To do this, the grooves of the rollers interlock. Before switching to HORN's tool systems in 2008, mechanical, cam-controlled automatic lathes of older design were used in production. "The production process was reliable, but retooling and tool changing were very time-consuming," says Marchese. To increase productivity, the company decided to take a big step and invest in modern Swiss-type lathes. In addition to the new machine technology, the tool concept also had to be revised. The old machines used specially ground tools, some of which were still made from HSS.

The classic: The design of the pasta machine has remained unchanged for decades.

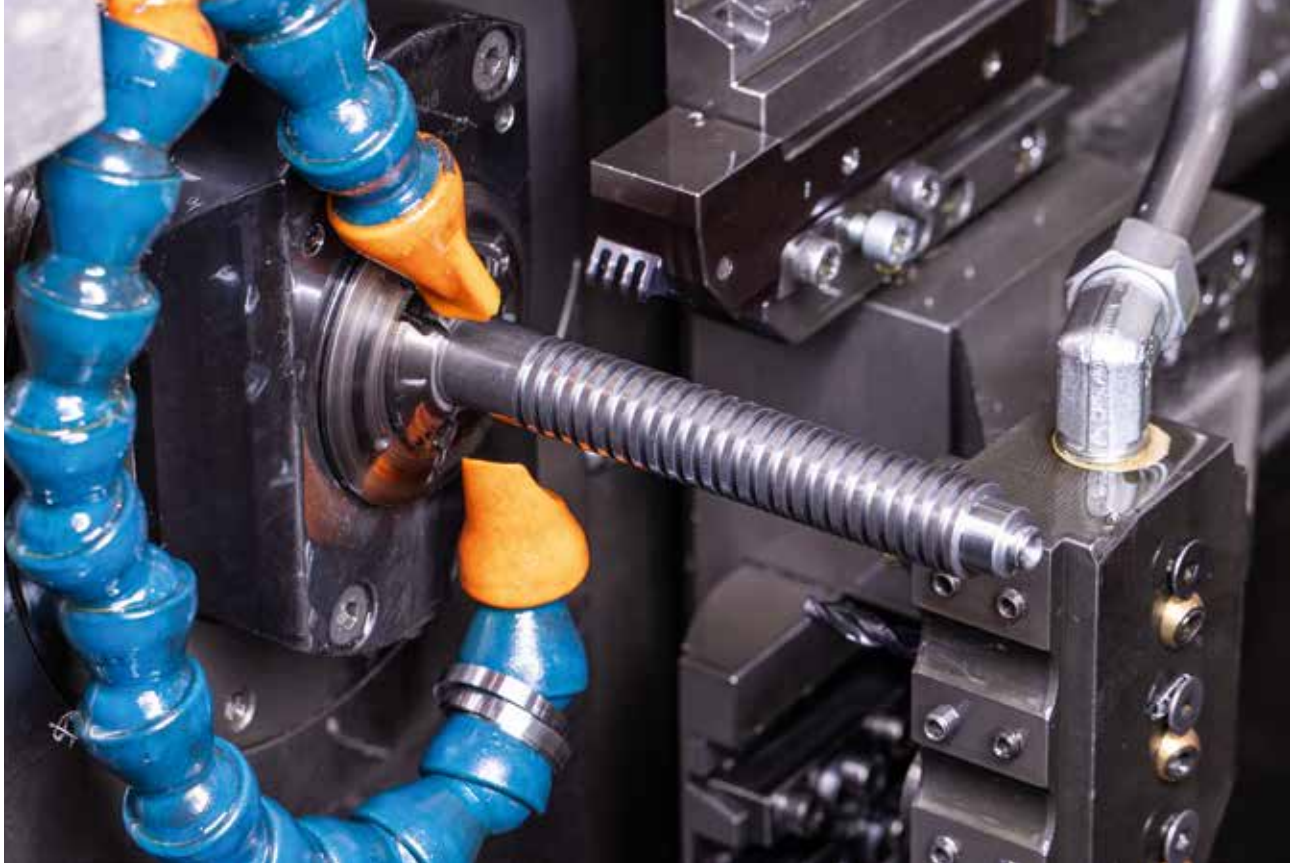
Two million rollers

Febametal application engineer Andrea Panichi remembers: "Designing the tool concept was not easy. We had to prove that it was worth investing in cost-intensive special carbide tools." Panichi's efforts convinced those responsible at Imperia & Monferrina. In addition to higher productivity, the tool systems achieve a tool life that is in some cases 30 times longer than previously. Around two million of the pasta moulding rollers in diameters of 18 mm (0.709") and 14 mm (0.551") are produced each year on eight swiss-type turning machines. The company manufactures the rollers from stainless steel and carbon steel.

There is a special roller mould for each type of pasta. It incorporates grooves of different widths depending on the pasta type. A mould for wide pappardelle has fewer grooves on the shaft than one for thin spaghetti. Different HORN grooving systems are used. To achieve greater efficiency when turning the individual grooves, one tool is used to machine several grooves in one pass. The three-edged grooving system 315 is used. On the carbide blanks, which have a maximum cutting width of 15 mm (0.590"), several teeth can be ground at the same time. "The 315 system is very suitable for this, as the cutting depth of around 3 mm (0.118") is not too much. Furthermore, the tool does not need to be remeasured when turning the indexable



The 315 indexable insert system enables changeover accuracy within microns thanks to the precise insert seat.



Up to four grooves can be cut simultaneously with the special cutting insert.

THE MOULDING ROLLERS NOT ONLY SHAPE THE PASTA BUT ALSO CUT THE PASTA DOUGH.

A successful collaboration: Federico Marchese, Andrea Panichi, Enrico Ancona and Enzo Zappavigna.

insert, as its seat has a changeover accuracy in the range of a few microns," explains Panichi. During the grooving process, the tool produces up to four grooves in one pass. Another special feature is the burr-free grooves. "The grooves are sharp-edged, as their corners act like a kind of knife to cut the dough," says Marchese.

Slot broaching with Supermini

Each roller has two drive slots to transmit the torque of the manual force or an electric motor to the moulding rollers of the pasta machine. A Supermini N105 tool is used for broaching the 3 mm wide by 2 mm (0.079") deep slots. During the process, the machine positions the tool in front of the hole and starts broaching the slot, which is around 20 mm (0.787") long. The individual axial shaping strokes are divided into increments of 0.1 mm (0.004"). There is no need for a recess at the bottom of the groove, as the tool moves freely inside on a programmed path.

The process of slot broaching on the machine offers the user various advantages. Different slots, profiles, gears or guide slots can be produced. A single clamping is sufficient to produce the workpiece. This means that further machining steps or even investments such as broaching machines can be saved. Furthermore, complete machining helps to increase precision and boosts the productivity of machining processes.

Imperia relies on the Supermini type N105 system for slot broaching.

COMPLETE MACHINING HELPS TO INCREASE PRECISION AND BOOSTS PRODUCTIVITY.

The collaboration between the Italian pasta machine specialist Imperia & Monferrina, HORN and Febametal has been in place since 2008. "Since our big move from cam-type machines to modern CNC sliding-headstock automatic lathes, we have always received a great deal of support with the tooling. This has enabled us to increase the productivity of our machining processes enormously," says Managing Director Enrico Ancona.

Imperia & Monferrina

Imperia was officially founded on 3rd February 1932 as an evolution of a small artisan business and immediately began selling pasta machines worldwide. The United States of America became the most important market, with its many Italian emigrants who, thanks to the use of pasta machines, established a kind of sentimental connection with the flavours of their distant homeland. Today, Imperia exports to 77 countries worldwide. As the company has expanded, the Imperia brand has become synonymous with durable household products with a strong brand identity. Today's range comprises more than 25 items, each specially developed to guarantee a distinctive quality of fresh pasta. The pasta line has been complemented by a range of small kitchen appliances (graters, tomato presses and meat mincers). The company offers three product lines: Home, Professional and Electrical Appliances. Production takes place at the factory in Sant'Ambrogio, Turin.

HORN WORLDWIDE: ITALY

PRECISION IS A PASSION

A small miracle: the biological prosthesis can be folded up, manoeuvred through the blood vessels and unfolded again in the heart.

Shortness of breath, dizziness and a feeling of pressure in the chest – if the pockets, or leaflets of the aortic valve no longer open sufficiently for the blood to flow, it is known as aortic valve stenosis. This heart defect can only be treated with an artificial aortic valve. The Italian company Corcym from Saluggia uses its extensive expertise to produce the implants, helping people to improve their quality of life and saving lives. Tolerances in the micron range and materials that are difficult to machine are the order of the day for the production of these small marvels. In order to machine them productively, the company relies on tools from HORN and technical advice from Febametal.

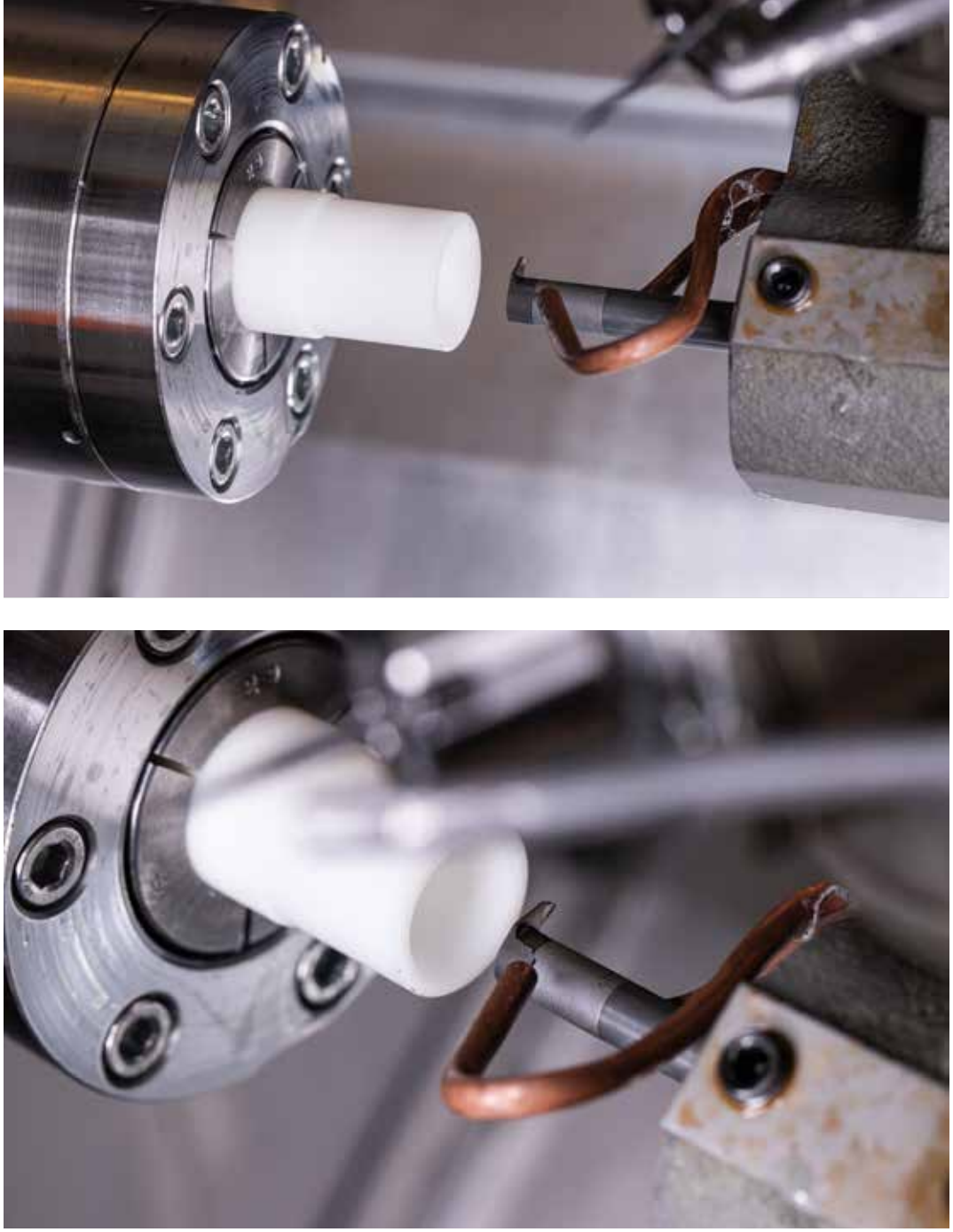
One of the most common heart defects is aortic valve stenosis. This is a narrowing of the aortic valve. As a result, the flow of blood from the left ventricle into the aorta is impaired. If the narrowing is severe, symptoms such as shortness of breath, pressure, dizziness and loss of consciousness can occur. The disease is usually caused by wear and tear processes such as calcification and hardening of the tissue. Aortic valve stenosis usually occurs only in old age. The narrowing cannot be treated with medication. Depending on the clinical picture, an implant may have to replace the valve. The patient's individual circumstances determine whether the valve is inserted minimally invasively through the femoral artery or conventionally through an opening in the sternum.

ONE OF THE MOST COMMON HEART DEFECTS IS AORTIC VALVE STENOSIS – A NARROWING OF THE AORTIC VALVE.

Flaps made from bovine tissue

The respective implants differ in terms of structure and material. For minimally invasive surgery (TAVI procedure), the implant must be movable and expandable so that the surgeon can manoeuvre it through the blood vessels into the heart. Due to the short shelf life of 10 to 15 years, biological aortic valves are given to elderly people or patients who are unable to undergo open heart surgery for health reasons. The construction of a biological implant is complex. The artificial valve made of a biological material is sewn by hand around an expandable wire mesh. At Corcym, this material is obtained from bovine tissue. The tissue, from specially bred cattle, is processed in such a way that it no longer contains any DNA or living cells so the body will not reject it.

The other option is the use of a mechanical aortic valve prosthesis. Mechanical valves are character-



When machining the ring from an abrasive plastic, a PCD grade is essential.

ised by their lifelong durability, meaning that a repeat operation is unlikely. The implant is inserted into an open heart. The patient is connected to a heart-lung machine during the operation. The design is simple. Two movable flaps are mounted in a plastic ring that will open and close with the blood flow. A synthetic fabric is stretched around the ring. The surgeon sutures this tissue to the aorta during insertion. Even if the structure and function are simple, the production of the mechanical aortic valve is complex.

Stringent requirements

"The production of the mechanical components is very complex. We check every manufactured component under a microscope at 20x magnification," explains process engineer Davide Ricchiari. The components must not have any scratches or burrs. Any imperfection, no matter how small, could lead to a stress fracture or harbour germs. Rough surfaces could also lead to calcification of the components, which would impair function. "To ensure perfect function, all components are manufactured to tolerances of just a few microns. Furthermore, the tolerances are also necessary for the certification of the implant. A human life depends on these components in later use, which is why we work here with the utmost care," says Ricchiari.

The outer ring of the mechanical implant is made from a special plastic. The micron tolerances for the internal turning of plastics require a great deal of expertise. The focus is on roundness and diameter tolerance. If these are not met, the two inserted valves will not close tightly. As a result, blood could flow back into

The Mini type HORN system is used for boring.

the heart due to the patient's blood pressure. Corcym uses PCD-tipped inserts in HORN's Mini range to bore the rings. "The material is highly abrasive. A sharp carbide cutting edge is rounded after just a few components," explains Febametal application engineer Andrea Panichi. This was precisely the reason for switching to the diamond PCD grade. Before switching to the new special material, the rings were made from a less abrasive plastic. "The production of the rings was very time-consuming. After roughing, we had to heat treat the parts to relieve the stresses in the material. Otherwise, we would not have been able to maintain the tight roundness tolerances during finishing," says Ricchiari. Switching to the PCD grade achieved the same performance as carbide when machining the previous material. Heat treatment before finishing is no longer necessary with the new plastic, but the material is not easy to machine. "A sharp insert is very important," says Panichi. Excessive cutting pressure can lead to deformation of the thin-walled ring and thus to ovality.

Titanium lock ring

Another important component of the mechanical aortic valve is the lock ring made of a titanium alloy. The ring tensions the tissue layer, which is sewn to the aorta, to the plastic ring. Put simply, it functions like a locking ring used in mechanical engineering. If it fails, the ring with plastic flaps could come loose and travel up the aorta with the blood flow. Great care is also required when manufacturing the ring. "The rings must be perfectly round on the flanks. Burrs or sharp transitions could damage the synthetic fabric when it is tensioned. The rings are subject to a 100 per cent inspection under a microscope," explains Ricchiari.

A Mini 108 insert is also used for boring. It is precision-ground with a special profile that also allows it to be used for parting off the ring. During the production process, the machine pre-turns the rings on the outside and inside. Several rings are turned, which are connected to each other by a narrow web. The rings are then parted off.

The mechanical aortic valve opens and closes with the patient's blood flow.

A successful collaboration: Barbara Costa (Febametal) with Davide Ricchiari and Andrea Panichi.

Extensive portfolio
The face-clamped inserts of the Mini type are one of HORN's core products. The tool system is mainly suitable for turning applications. The precision tools have proven themselves in particular for internal turning and grooving. With the vibration-damped carbide tool holders, the inserts produce good surface finishes even with long overhangs and ensure highly reliable processes. The Mini system's extensive portfolio offers inserts in various sizes for different internal diameters, geometries and substrates as well as CBN or diamond coatings.

Corcym has been relying on HORN tool solutions for over 15 years. In addition to the Mini systems, numerous Supermini types are also used for boring. "We regularly test various tool systems from different manufacturers. So far, no others have delivered anywhere near as convincing a performance as the HORN products. Furthermore, Febametal's technical advice is always a great support for us," says Ricchiari.

THE TOOL SYSTEM IS MAINLY SUITABLE FOR TURNING APPLICATIONS.

Corcym
With a history dating back more than 50 years, Corcym is an independent, global medical industry company focused on alleviating structural heart disease. Corcym's vision is to become the leading company for cardiac surgeons and their patients by providing the best solutions to combat structural heart disease, for which the company has a broad portfolio of approved and patented products. Corcym has two FDA- and EMA-certified manufacturing and R&D sites in Italy and Canada.

DIGITALISATION

INDUSTRY 4.0 AWARD

For the second time in a row, HORN has received the Allianz Industrie 4.0 Award Baden-Württemberg for an outstanding Industry 4.0 solution. The award underlines HORN's continuous pursuit of innovation and its pioneering role in the digitalisation of production.

Problem definition
HORN tools must meet the highest standards of precision and quality. These are crucial in areas such as optics and highly efficient gear manufacturing. The purchase of these tools involves considerable investment. To extend the service life of the tools, HORN offers reconditioning services worldwide.

Until now, tool servicing was only economical for large quantities. "We process the tools in fixed steps - regardless of their actual wear – as it is not feasible to efficiently document individual measurements and decisions," says André Hoettgen, Group Manager Enterprise at HORN.

Solution approach
To digitally map the life cycle of precision tools and ensure the recording of quality-critical data, HORN has implemented a web-based solution customised for specific product groups. The "HORN Service Platform (HSP)" digitally supports the relevant production processes and accelerates administrative tasks. Based on the I4.0 infrastructure that received an award last year, more than 15 internal stations were connected: from creation to the end of the life cycle (tool) and from goods receipt to shipping (service). The most important processes include laser marking, grinding, various tests and measurements, cleaning, blasting and coating, packaging and shipping.

The HSP assigns a unique identification number to each precision tool. This transcends the system boundaries of a classic ERP system. Data can be seamlessly recorded throughout the entire service process, digitally assigned to the tools and displayed in the web interface in a structured and transparent manner. This includes all quality-critical data, such as directly measured values (height, diameter, concentricity, etc.), test reports, images and comments, and improves traceability.

Regrinding service: MCD inserts can be repolished several times.

Customers and production share one system, but with individual views and clear demarcation of the data (multi-client capability). The administrative processes, for example when assessing the initial condition after receipt of the tools or when maintaining order data in the ERP, are supported digitally. André Hoettgen: "Where possible, HORN has fully automated administrative tasks. This has prevented errors and reduced lead times."

Impacts/added value

The introduction of the HSP significantly improved delivery performance and created full transparency across the entire tool life cycle. The data collected provides the basis for future analyses and optimisation of the manufacturing processes. Customers can access this data via interfaces. The reduction in machining steps has a positive effect on the service life of the tools and thus on costs and the environment. HORN is gradually rolling out the solution and will use it for other product areas in the future.

"With the HSP, we are focusing on customer needs and are continuously working on digital offerings and the efficiency of the service business model," summarises André Hoettgen.

Even cost-intensive tool systems for skiving gearwheels can be reground several times.

TO EXTEND THE SERVICE LIFE OF THE TOOLS, HORN OFFERS RECONDITIONING SERVICES WORLDWIDE.

IN PRACTICE

USING DIAMONDS FOR THE PERFECT FITTING

Designers, architects and discerning customers - when planning bathrooms or kitchens, they all place rigorous demands on the fittings installed. The design of taps and shower heads must fit seamlessly into the overall interior design concept. The Belgian company RVB shows that not all taps are the same. The manufacturer produces in Brussels its high-quality taps through which water flows worldwide every day. Production Manager Louis-Philippe Gillieaux relies on both modern CNC machining centres and manual craftmanship in production. To ensure the high quality of his products, he relies on diamond tools from Paul Horn GmbH for achieving high-gloss surfaces.

"The quality of the surfaces is very important. It should be precisely cylindrical or, in the case of shallow fittings, perfectly flat. We can't achieve this precision by polishing," says Gillieaux. A polished surface reflects and shines, but it is not flat. This is why polishing is not a geometrically precise manufacturing process, even if it is done by a machine. Optimal polishing results are very time-consuming and expensive. "Finding a good polisher is very difficult. It's a job that not many people want to do because it's very demanding," says Gillieaux and continues: "To further increase the quality of our premium fittings, we coat the fitting parts with a layer of copper and nickel before chrome-plating or gold-plating, just like in the old days. This enhances the subsequent shine and colour and improves the adhesion of gold and chrome to the brass base material, which contributes to even longer service life of the fittings. Although polishing produces a high lustre, it is not a geometrically precise processing method, as anyone who knows anything about polishing will tell you. Polishing away one micron too much on the surface of a brass part destroys the perfect impression of the subsequent mirror finish. These tiny geometric errors are particularly noticeable on rotationally symmetrical or flat mirror-finish surfaces."

An MCD-equipped S117 system is used to machine the end faces.

The user does not need any special machines for high-gloss turning.

Monocrystalline diamonds

For these reasons, Gillieaux and his team have been using MCD tools for over 15 years. The monocrystalline diamonds produce surfaces that make subsequent polishing unnecessary. The switch to automated production has resulted in not only a big increase in quality, but also in cost savings. "By using diamond tools, we have greatly reduced the cycle time," explains Gillieaux. Before switching to the diamond tool systems from HORN, the team used tools on which the diamond was brazed directly onto the tool holder. Due to the cumbersome handling and time-consuming servicing of the tools, they were looking for a modular tool solution. The arguments put forward by HORN technician Kees van Bers convinced Gillieaux and his team.

Today, RVB relies on a wide range of HORN MCD tools. The high-quality inserts are used on conventional CNC machines. "You don't need special machines for milling and turning high-gloss surfaces. The quality is produced by the inserts," explains van Bers. In addition to turning tools, Gillieaux also relies on MCD milling tools. "We were sceptical at first because of the high cost of the cutting tools, but the performance and results have now completely won us over," says Gillieaux. When asked about the service life of the tool systems, van Bers jokes: "With an infeed setting of around 0.02 mm (0.0008") in brass, tool life can be described as 'everlasting'. If an insert does become blunt, it can be repolished up to 20 times, with the same everlasting tool life each time. The greatest danger for MCD tools is operator error."

The pinnacle of machining

High-polish machining with MCD is one of the supreme disciplines of metalcutting processes with geometrically defined inserts. Two hundredths of a millimetre of finishing allowance separate a very good surface from the perfect surface with a mirror finish. The range of applications is broad. The manufacturing process is used in numerous industries. In the jewellery industry, for example, the tools provide the shine when producing the visible parts of a high-quality wristwatch and most wedding rings. In the production of mirrors for space telescopes, the almost perfect dimensional accuracy of the milled mirror surface guarantees a distortion-free view into space. Diamond-tipped tools are used in the manufacture of almost every visual aid, whether spectacles or contact lenses. Another possible ap-

THE HIGH-QUALITY INSERTS ARE USED ON CONVENTIONAL CNC MACHINES.

plication is in tool, model and mould making. Here, time-consuming and expensive polishing can be saved. The list goes on, and these tool systems are firmly established, not least in the medical industry.

The quality of the tool cutting edge plays a decisive role in producing surfaces with a mirror finish. The quality of the cutting edge is reflected in the machined surface. The final honing or polishing of the MCD cutting edge is an art. Similar to the cutting of a gemstone, the finishing of a tool cutting edge for high-polish machining is done by hand using pliers. Air-bearing grinding tables with a solid granite table top provide optimum conditions for grinding the inserts. A microscope with 200x magnification is used for visual inspection. Under this magnification, the cutting edge must be absolutely free from nicks. The resulting insert has a maximum radius of 0.0002 mm (0.000008"). HORN has developed a special machine for grinding MCD ball nose end mills for high-polish machining of freeform surfaces.Even the smallest radii can be reliably ground.

Synthetic diamonds

HORN relies on high-purity MCC diamonds to equip its MCD tools. These monocrystalline stones are created using the CVD process. Various gases, mainly methane, are used as a source of carbon, which is deposited during the process and allows the diamond to grow. The diamonds are characterised by their crystal clear to slightly brownish colour, depending on their thickness. A major advantage of this process is the edge length of the stones. It means that even long tools with cutting edge lengths of 30 mm (1.181"), for example, can be realised. Previously, natural diamonds had to be used for such tools, which was difficult to justify due to their high price, scarcity and natural inclusions.

THE FINAL INSERTS AND POLISHING OF THE MCD CUTTING EDGE IS AN ART.

High-polish milling produces perfect flatness and mirror-like surface finishes measured in nanometres.

High-gloss turning of the outside diameter with an MCD-tipped ISO insert.

International designers

The MCD inserts are used at RVB in over 50 different parts for fittings. The design of the various series of fittings comes from international designers. "The design is the most important feature for successful competition," says Gillieaux. To this end, RVB works closely with renowned artists. "The designers get in touch with us with their ideas. If they match our DNA and are technically feasible, we implement them in a product series," says Gillieaux.

The partnership between RVB and HORN has existed for over 15 years. In addition to MCD tools, the team also relies on HORN tools for grooving and parting off. "No matter what requirement we contact HORN with, we are always presented with an appropriate solution. The service doesn't stop after the sale. HORN technicians keep at it until the production process runs perfectly," says Gillieaux.

A successful collaboration: Louis-Philippe Gillieaux in conversation with Kees van Bers.

RVB

The engineer Gaston van Bastelaere founded the RVB company in 1935. The following year, he patented his first inventions, including the FOR valve system. This ensures the tap closes perfectly by preventing crushing of the seal. Even back then, this was a small revolution. With numerous other developments and bold designs, the entrepreneur was often ahead of the trends in the tap industry. The shapes and functions of RVB taps are still contemporary today. In 2004, Alain Gillieaux bought the company and modernised it fundamentally. However, he always took care to retain the in-house expertise. Louis-Philippe Gillieaux continues the company with the same approach.

DEUTSCHLAND, STAMMSITZ
GERMANY, HEADQUARTERS
—
Hartmetall-Werkzeugfabrik
Paul Horn GmbH
Horn-Straße 1
72072 Tübingen

Tel. +49 7071 7004-0
Fax +49 7071 72893

info@de.horn-group.com
horn-group.com