Issue 2/14

world of tools

THE CUSTOMER MAGAZINE FROM HORN

TOPICS:

SERIES PRODUCTION
HISTORY
TRENDS
USER REPORTS

- Outlook for AMB 2014
- Gear milling
- HORN in Sweden
- HORN Academy

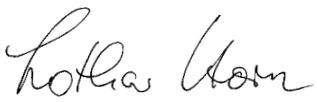
EDITORIAL

Dear Readers,

The AMB in Stuttgart, the IMTS in Chicago and the BI-MU in Milan are just around the corner and represent the trade fair highlights of 2014. These events allow us to place our product innovations and enhancements right at the centre of public attention. In addition to machining between two flanks, our focus this year will be on high-tech applications beyond this sector.

The central topic of this issue is series production. Whether it's on a small or large scale, this kind of production requires quantity, quality, process reliability and repeat accuracy – and in many cases, simply having a good product is not enough to meet these criteria. Experience tells us that the best possible results are produced when the customer is engaged in a dialogue. That's exactly why we see ourselves as not just a tool supplier to our customers, but as a technology partner for them too. Over the course of 2014 we have significantly expanded our field sales force so that we can guarantee this in the long term. This will ensure that our customers receive even better care and service directly on site.

The HORN stands in Stuttgart, Chicago and Milan will provide a venue for series manufacturers, as well as job, batch and mass manufacturers, to find precisely the solutions they are looking for in order to meet the many and varied challenges that the machining sector presents. Why not stop by and see us too? Until then, we hope you enjoy reading this issue of world of tools.



Lothar Horn
Managing Director,
Hartmetall-Werkzeugfabrik Paul Horn GmbH
Tübingen

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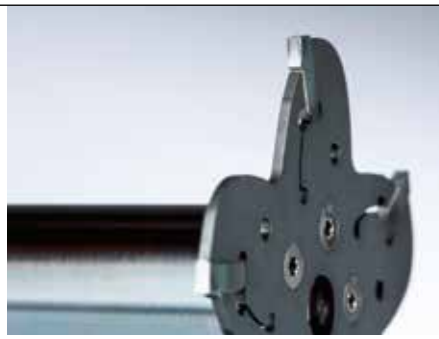

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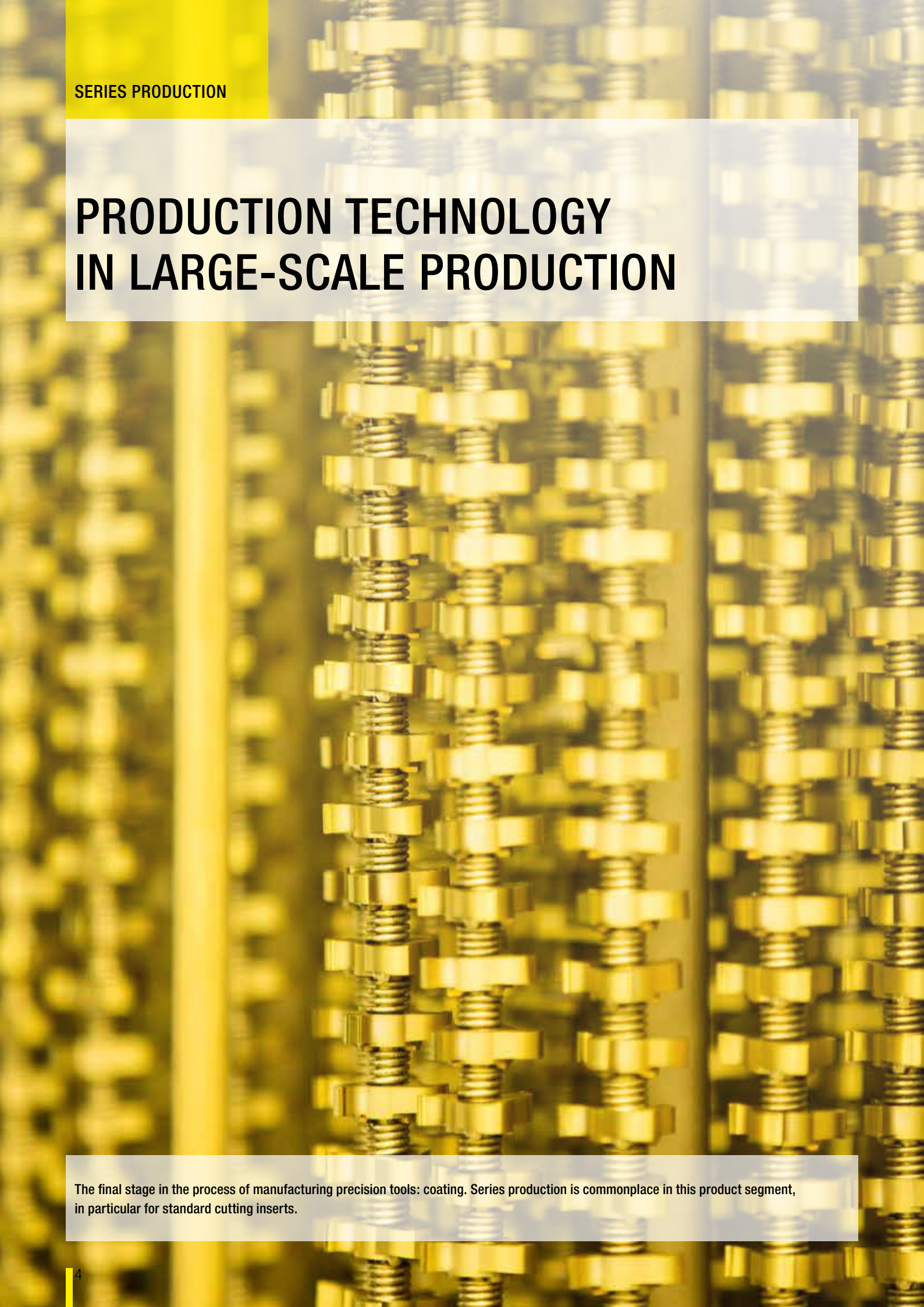
PRODUCTION TECHNOLOGY IN LARGE-SCALE PRODUCTION



The final stage in the process of manufacturing precision tools: coating. Series production is commonplace in this product segment, in particular for standard cutting inserts.

Revolution and evolution

It is difficult to pin down the exact point at which production can be defined as large-scale. For some manufacturers, producing 1000 parts a month marks the start of large-scale production. For those manufacturing fittings for water installations or plug connectors in the electrical industry, on the other hand, or those producing coins or manufacturing cars, 1000 parts could be the outcome of a day, an hour or even minutes.

If we go right back to the roots of modern series production, we often associate it with the introduction of the assembly line by Henry Ford for the purpose of manufacturing the Model T, or Tin Lizzy as it was colloquially known. What this actually marked, however, was the dawn of automation; the coming together of several hundred parts in one tight, fine-tuned sequence. This automation required the necessary individual components to come ready-manufactured in a standardised series production process involving narrow dimensional tolerances, and it was only a short time before assembly belt production had significantly enhanced the profile of series production.
Series production itself goes a long way back. When the pyramids were being built 5000 years ago, the Egyptians were using millions of standardised stone blocks from various quarries. And even 2000 years ago and more, the Chinese army was fighting with countless numbers of weapons that had sophisticated interchangeable parts. In the late Middle Ages, Germany's hammer mills were producing hundreds of thousands of halberds, swords, scythes and sickles. In those days, nailers were highly adept at producing large quantities of items – but they did it all by hand.

Standardised stone blocks as a symbol of early series production.

The start of machine-based series production

Series production using machine tools in standardised processes has its origins in early 19th-century America, which saw the mass production of the same type of muskets in their tens of thousands. This trend was again illustrated a few decades later by the production of millions of revolvers by Colt and Co. Indeed, the world of today and the prosperity we see in it would not be conceivable without series production. Ever since those days, the large-scale production of countless component types, each manufactured in different quantities, has been the backbone of our global industry – and it all has its roots in a time predating the electrical and automotive industries. While only 9500 cars were assembled globally in 1900, by 1913 this figure had already reached 600,000 thanks to the introduction of assembly line production, and in 1919 it soared to two million. Nowadays, around the globe we manufacture 90 million cars in more than 1000 models a year – each made up of approximately 10,000 individual components.

Series production in the Middle Ages also includes the minting of coins.

The Gutenberg printing press is a milestone in series production.

Assembly of Ecolife/Ecomat transmission, Friedrichshafen, ZF Friedrichshafen AG.

The drive behind technological advancement

More than a hundred years since Professor Georg Schlesinger's 1904 doctorate on the subject of fit classification systems in machine tool engineering, his views and statements still hold true: “The machine tool is the mother of all machines” and “The dividends of companies are seated on the edges of tools”. These statements from the past will have a say in our future, even if the requirements and demands placed on machining processes have changed fundamentally.

Global competition for markets, costs and orders, for the best solutions and products, and for favourable production conditions has grown increasingly complex and takes place on many interacting levels. This competition is driven by global business demands for mobility and communication as well as health, leisure and well-being. As society changes and these new conditions are incorporated into policy, they set out the requirements and challenges that the world is required to meet – and it is through technical innovation that they are ultimately met. The interacting levels involved in this are innovative enterprises – including those in joint development clusters, institutions of research and higher education, as well as a plethora of peripheral networks. Highly efficient manufacturing technology, sophisticated materials engineering techniques, plus powerful electronics and software are regarded as the pillars of this system. In the future, competition will no longer take place between companies, groups and countries. In the competition for ideas, innovations and markets, it is instead transnational social structures that will win through, by providing advanced technical training and experience with support from a wide range of sources; powerful and flexible manufacturing technology; seamless communication and network structures; and a culture of innovation.

Series production: The backbone of our industrial society

Series production and large-scale production, whatever form they take, are the backbone of our industrial world and form a part of the manufacturing process for every commodity that we use in our day-to-day lives. Production engineering is one of the pillars that supports this system and, for decades, has acted as the stage for the battle among tool and machine tool producers to find the next major advancement in the field. The ability to respond to new material requirements and new machining procedures, high levels of quality, suitability for series production, ever-growing productivity, absolute process reliability and excellent availability are the top considerations when developing these two technologies, and have mutually dependent relationships.

The machine tool: Added value by definition

While machine tools in the past were designed predominantly based on the criteria of performance, precision, durability and investment security, those found in today's series production are more like consumer goods whose benefits come from the maximum added value they offer. Therefore, the key here is to increase their added value by ensuring high output levels and reducing cycle times. Machine tools in series production – whether they are stand-alone elements, part of a chain in an overall assembly line, or designed as rotary transfer machines – are reliable and designed for three-shift operation. Together with clamping devices and tools, in project work they are ideally

suited to the longer periods of series production associated with components or part families. Manufacturers fight to make the most of each split second by optimising their machining sequences and exhausting their power reserves; in fact, profitability per part produced is often defined not by whole numbers, but in those fractions found at the second or third decimal place. To accommodate the many special solutions they are required to develop, efficient and innovative machine tool manufacturers keep their toolboxes filled with all kinds of different ideas and approaches.

Although DIN/ISO programming has a long history in series production and is still being used today, for many years now it has not been able to live up to all the requirements that control systems present. Experienced and well-trained machine operators and fitters are in a position to make use of control features for fault analysis and process optimisation, or such is the case at least in the sophisticated, highly autonomous kind of society we live in today. These features include programming simple cycles for complex machining operations, using graphic 3D simulations for avoiding collisions, translating CAD/CAM data into optimised machining programmes, rotating tools and levels, optimising machining programmes, and so on. However, in series production – taking the automotive industry and its closed processes as an example – approval has to be granted before any of these can be done.

Tools and cutting subject to the most stringent requirements

As key manufacturing components, cutting tools can and must demonstrate the utmost flexibility in responding to changes in general conditions. Many aspects – including the ever-increasing geometric and physical requirements for individual components, as well as weight reduction, more functional surfaces on smaller components, increased forces on smaller bearings, higher corrosion resistance and thermal stability levels, and requirements for more hardness or tensile strength – have made it necessary for manufacturers to develop materials that are increasingly better suited to the functions that the application is performing. Every material in each specific machining variation requires tool solutions that are specially designed for that variation. In this context, series production also places high demands on the robustness of tool systems and their cutting edges. It requires a highly reliable tool life and a high level of indexability, as well as superior surface quality with exceptionally narrow tolerance ranges. Other criteria include good chip control, as snarl chips or long chips will create a hindrance in any series production process. Tools that are suited to series production are characterised by good attenuation properties and excellent dynamics. Combination tools, meanwhile, cut down tool change times. A high mechanical load capacity, good reliability and an efficient supply of coolant to the cutting zone are all requirements that tools are dependent on. Cutting processes also use cutting materials with particularly hard and durable properties, as well as ceramics, CBN, PCD and CVD-D with chip shape geometry for enhancing process reliability using defined chip control. A large amount of preparation is put into optimising the cutting material, substrate, coating, macrogeometry and microgeometry of each tool and each cutting edge to suit its specific application.

Profitability in the green zone – but not at the edge of the red

Ongoing developments in the areas of substrates, binders, coatings, 3D geometries, 3D pressing procedures, and others besides, are constantly opening up new opportunities for designing faster, more efficient and more economical long-term series production processes. However, Alfredo Vela, Production Manager at Lupold in Vöhringen, remarks: “Peak performances have their limits. Our experience shows that it is not possible to achieve maximum profitability with processes that are hovering on the edge of the red zone – that is, the less reliable zone. Processes that are firmly in the green zone are stable and economical, do not have any outliers and are able to tolerate material fluctuations.”

There is also a trend that is turning away from the path that leads to more and more mass production, and is instead heading towards custom manufacturing processes involving smaller, differentiated quantities. In mature markets, the automotive industry is increasingly coming down on the side of individual designs or models that are customised by the purchaser: a far cry from mass-produced goods. To some extent, this in turn leads to smaller quantities and to new requirements relating to the flexibility and readiness for delivery that tool manufacturers need to demonstrate.

Combination tools cut down on production and non-production times alike during series production.

Milling a slot using the M101 slotting cutter whilst drilling a coupling follower for an electromechanical lock at the same time.

MILLING, NOT SAWING, HAS THE ANSWERS

Significant improvement thanks to new solution

A small M101 side milling cutter from HORN, featuring an 80 mm (3.1496") diameter, seven teeth and a width of just 1.6 mm (0.063"), has enabled the Albstadt factory of Assa Abloy – the world's largest manufacturer of locking and security systems – to achieve savings of EUR 35,000.

Assa Abloy Sicherheitstechnik GmbH, one of whose factories can be found in the German city of Albstadt, is a world-renowned manufacturer of mechanical and electromechanical security solutions that provide protection, security and convenience in buildings. The company develops, manufactures and sells high-quality products and versatile systems for the private, commercial and public sector under the long-standing brands IKON, effeff and KESO. The Swedish Assa Abloy Group is the world's largest group in the security engineering sector. Since it was founded in 1994, Assa Abloy has grown from a regional company to an international group with 43,000 employees and an annual turnover of more than EUR 4.7 billion. As the world's leading group in the industry, Assa Abloy offers a more complete range of locking solutions and security systems than any other company in the market. A recent development is a door fitting for online access control systems featuring Aperio technology, designed for use in industry-standard doors with mechanical locks. The door is opened using an RFID badge and an optional PIN, while a wireless link that uses AES encryption means that neither the system nor the doors need to be wired. The lock is quick to install, making it extremely cost-effective.

Machine running time of 6800 hours a year

A “follower” with a slot serves as the mechanical coupling between the door handle and the security lock. This, along with more than 500 other mechanical parts such as latches, bolts and bearing blocks, are manufactured in the effeff factory in Albstadt. The materials used in the production process are steel, stainless steel, brass, aluminium and plastic. In the highly efficient turning and milling department, the effective machine times of the nine machining centres add up to a total of 62,000 hours a year – one alone manages 6800 hours.

Solid carbide saw blade unsuitable for large-scale production

Historically, the average number of units from the “Internal Follower” part family, made of material 1.7131 (16MnCr5), that could be manufactured in their entirety – that is, turned, milled, drilled and slotted – in the space of a week was between 500 and 1000,

and the tendency was increasingly to use a 12-axis Nakamura Tome NTY. The task in this application was to mill a slot measuring 1.6 mm (0.063") wide and 16.5 mm (0.4696") deep into an 8 x 8 mm (0.315" x 0.315") square. Previously, this had been done with a 80 x 1.2 x 22 mm (3.1496" x 0.0472" x 0.8661") coated solid carbide saw blade featuring 100 teeth on the front, using a plunging method; a solid carbide saw blade measuring 1.6 mm (0.063") in width would not have been stable enough to produce it in a single cut. Three cuts were therefore necessary: one central cut and two cuts with an advance of 0.2 mm (0.0079") each on either side, for the two flanks. However, the saw blade only had a tool life of 200 parts. This, along with frequent tool changes – which in turn led to machine downtimes – and high tool costs made the three-cut method even more inefficient.

A large-scale production solution right away

As the quantity of parts produced was expected to rise to as much as 2000 a week, this would have meant two worn-out solid carbide saw blades a day – or ten a week. Frank Blocher, field sales employee at HORN in Tübingen, recognised the problem. He also knew the workpiece, as HORN tools from the N105 system for broaching internal corners and the S100 parting-off tool system with internal cooling were already involved in manufacturing the product. At the same time, Roland Daiber – the person in charge of the area producing the product – was looking for an efficient solution and happened to come across HORN's M101 side milling cutter. So it was that Blocher's information about the M101 and Daiber's enquiry about this same tool created a happy coincidence: the side milling cutter immediately produced a quantity of 1000 units with precise, reliable slot geometry on its very first attempt at the required cutting width of 1.6 mm (0.063").

Featuring a diameter of 80 mm (3.1496"), the side milling cutter is fixed by a driving collar set and equipped with seven S101 cutting inserts. The highly stable main body forms a positive-fit connection with the holder by means of the driving collar set. The saw blade, by contrast, was only fixed by a friction locking connection. The large chip areas ensure good chip flow, and

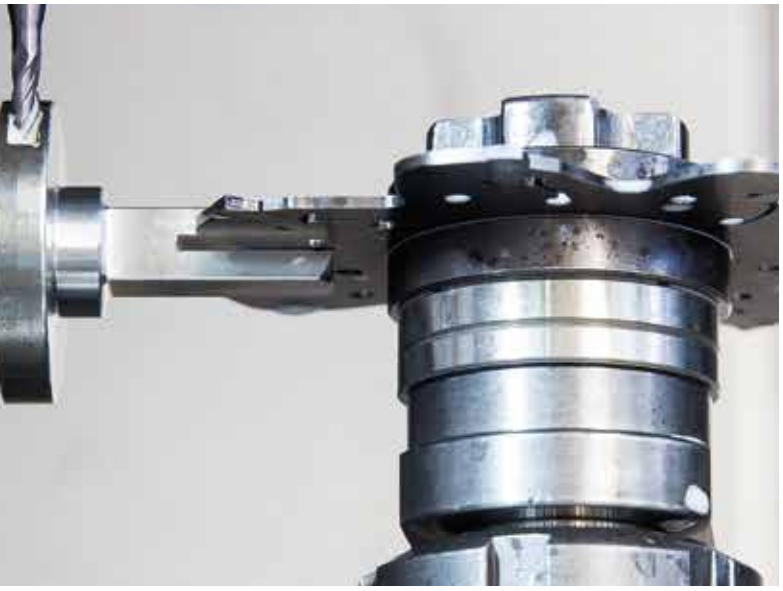
Andreas Jack, fitter and programmer at Assa Abloy; Frank Blocher from HORN; Roland Daiber, department head; and Antonio Brancato, fitter and programmer at Assa Abloy (from left): "For many years, HORN tools have been creating significant improvements in our production operations."

Lifting the clamping finger with a self-locking installation wrench. The stroke is restricted to a minimum. Both hands are left free to replace cutting inserts.

the cutting inserts are simple to install using the self-locking installation wrench. Both hands are left free to replace inserts. The installation wrench limits the opening of the clamping finger and thus receives the clamping tension.

M101 solves multiple problems

The S101 cutting insert, made of the durable basic substrate grade AS45 with positive cutting edge and chip shape geometry, tapers the chip, protecting the flanks as a result. The precision-sintered, long prism guides with back stop ensure precise guidance and a high level of clamping force even if the side milling cutter is operating at a high speed. The diagonal clamping of the insert in the direction of the cutting pressure directs the cutting forces to the back stop.
Roland Daiber is very satisfied with this solution: “The M101 side milling cutter has provided an immediate solution to several problems: we have increased service life five times over, reduced machining time by 60 percent, improved slot quality and enhanced process reliability during large-scale production. We used to spend a significant amount of time and effort on saw blade storage, inventory, regrinding and coating, and on storage costs, but now we've reduced all this down to one main body and a few cutting inserts.”



Milling the slot with the M101, using a plunging method. A smooth cut and long service life thanks to positive chip geometry.

Significant savings and no capacity issues

The story doesn't end there, according to Roland Daiber: “I do, however, want to emphasise two aspects in particular. By reducing machining time, we have radically expanded our machine capacity – to the extent that 2000 parts a week no longer present a capacity issue for us. And the second aspect is just as positive: according to our calculations, the M101 side milling cutter alone has saved us EUR 35,000 in costs compared to our previous machining method; many times more than what the tools themselves cost now.”
The close partnership between HORN in Tübingen and Assa Abloy in Albstadt has been maintained for many years. Frank Blocher himself has spent 13 of these working with Roland Daiber – an experienced, resourceful manufacturing specialist with a 29-year history at the company, going back to a time before effeff became part of Assa Abloy – to substantially improve manufacturing options using countless standard or specialist Horn tools, whether this has been for the purpose of parting off, grooving, internal grooving, circular milling, broaching or slot milling. The work has resulted in success with approximately 15 tool groups in many variations (smaller and large alike) – exactly as this most recent case involving the M101 side milling cutter has demonstrated.

Milling the upper and lower base of the bearing shell using the HORN M275 system at stations 6 and 7, and milling the installation points at station 9 using the HORN solid carbide milling cutter type DSS in a Pfiffner Hydromat HS 12.

GEARED TOWARDS PEAK PERFORMANCE

Fast, reliable and synchronised – the result of close cooperation

When a rotary transfer machine manufacturer recommends HORN carbide milling tools during a large-scale production project off the back of previous positive experiences, and the customer's equally positive experiences lead them to express a desire for these tools completely independently of the manufacturer's recommendation, then this is surely twice the proof of the quality that the large-scale production tools coming out of Tübingen have to offer. Indeed, this was exactly what happened in one particular decision made many years ago – and it has since paid off tens of millions of times over.

Andreas Lupold Hydrotechnik GmbH, founded in 1948 in Vöhringen, Germany, is active in two main sectors: hydraulics, which involves control and regulation valves as well as hydraulic lifting equipment for a whole range of markets and applications; and manufacturing high-precision automotive engine parts in their millions. This means parts ranging from the size of a cigarette packet, to crank cases and all the way through to powerful specialist hydraulics systems for airport ground support equipment. Bearing shells for crank shafts in medium-sized vehicles are an example of parts that are mass-produced by the millions. The completed assembly comprises two grey cast iron bearing shells, each of which is cast into an aluminium body and machined to provide location and support features. Overall dimensions are approximately 100 x 70 x 30 mm (3.9370" x 2.7559" x 1.1811").

Calculated to the third decimal place

As smaller parts for the automotive industry are manufactured in the millions, the processes involved must be completely reliable and costs must be calculated to the third decimal place. For orders of this nature, the manufacturer and customer generally agree on an annual price reduction of a few percentage points, which means that processes must be continuously improved in order to be economical.
Given that these bearing shell orders last for several years and produce millions of parts annually, the manufacturer needs manufacturing technology that is suitable for large-scale production, is highly productive and can ensure process reliability – and this was precisely what was found in Pfiffner, a rotary transfer machine manufacturer just around the corner in Rottweil. Pfiffner developed a solution as part of a project, working on the basis of the production requirements. This involved two Hydromat HS 12 rotary transfer machines, each with ten horizontal and two vertical machining stations.

Highly efficient rotary transfer machines

Rotary transfer machines, rotary indexing centres and modular automatic pallet transfer machines from the international market

leader Pfiffner are considered to be highly efficient. Pfiffner offers custom large-scale production solutions not only for machining rotation-symmetrical workpieces from bars, but also for highly precise, cubic components, for which the individual machining operations are distributed across up to 18 stations.

The preparatory work in the bearing shell project involved determining the feasibility and risks, how the machining sequences should be distributed among the individual stations, and the necessary clamping devices – then performing collision analyses as well as calculating and optimising cycle times using the cutting data from the HORN milling tools that the project planned to use.

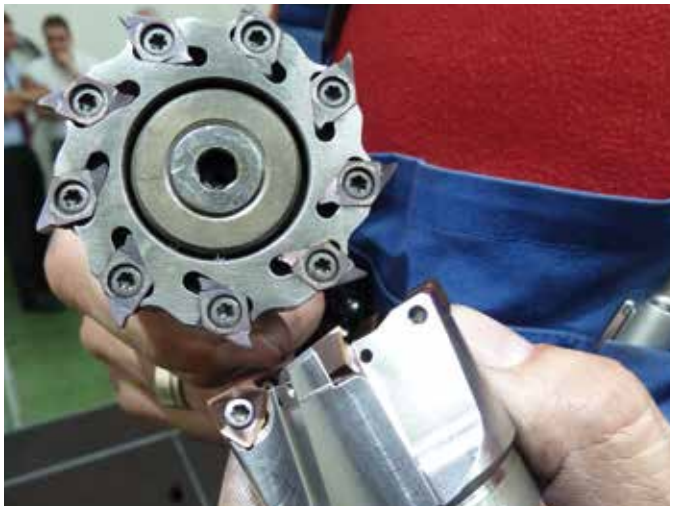
Seven of nine stations fitted with HORN equipment

Seven out of the nine active machining stations were kitted out with HORN tools – the two other stations carry out drilling operations. One station was chosen to remain empty, and two to load or unload. Peter Groschupp from Pfiffner's design department explains why HORN was considered to be the tool partner of choice right from the outset: “We've been cultivating a successful partnership with HORN for a long time now. Above all, we're impressed by the quality that the company provides time and time again. However, this quality is not just down to the outstanding capabilities, cutting quality and tool life of the equipment – it's also because of HORN's flexibility, the trust between us that has developed over the years, and the speed at which our partners in Tübingen respond to our requests. Of course, being close to Tübingen also plays a role. We're only 70 kilometres away, which means that we have frequent contact with the HORN office. However, when I say close, I don't just mean physical distance – I also mean the mutual trust and understanding for one another that have developed over the years.” Branimir Nikolic, in charge of process engineering at Pfiffner, adds: “Of course, we've considered other milling tools on many occasions, especially if the customer has wanted us to, but HORN tools have always impressed us with their performance and process reliability. We have worked intensively with HORN for ten or twelve years now. HORN's interest in volume business and our interest in offering reliable process solutions with a guaranteed high tool life are a good fit. Ultimately, the success of our business lives or dies by process reliability and high output levels. We only have a limited period in which to implement a project, so every additional day needed to deliver a machine in a thoroughly optimised condition costs a great deal of money. And that's exactly where an efficient, high-tech and flexible partner comes in.”

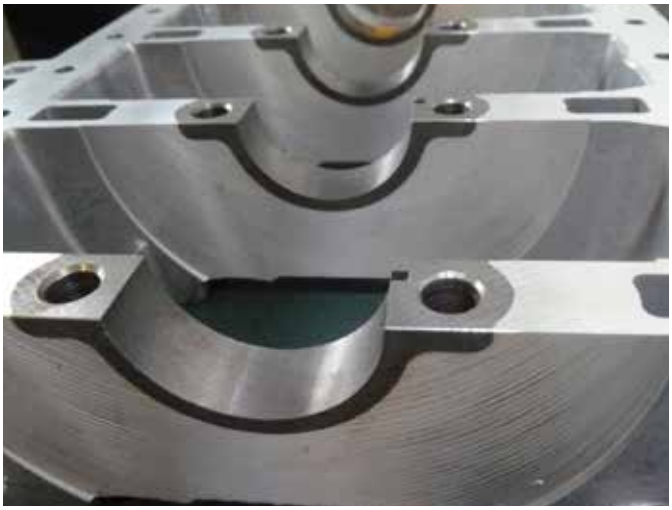
An ever-cautious approach to tools

As Peter Groschupp states: “We hand our machines over to our end customers with a finished, optimised process. This kicks off the practical optimisation process, which involves the input of our end customer and our tool partner HORN, but at this stage it is far from complete. The actual production process shows us where there is still further potential to be tapped into or where bottlenecks need to be remedied. At the end of the day, we have to remember that we remain responsible for the processes we have developed many years into the future – so, even if there is uncertainty about the source of a problem, nobody needs to ask whether the machine or the tool is at fault. That's why we take an extremely cautious approach when it comes to tools.”

Branimir Nikolic, process engineer, and Peter Groschupp, in charge of design at Pfiffner, as well as Joachim Hornung, Key Account Manager for projects and OEMs at HORN (from left).



M275 system from HORN with nine indexable inserts busy milling the lower base at station seven, and the DAM special tool system fitted with DA32 cutting inserts for finish-boring.



GGG60 bearing shells, in the form of half-shells cast in aluminium, combine to form a base and cover that create the crank shaft bearing.

Sophisticated tool strategy

Joachim Hornung, Key Account Manager for projects and OEMs at HORN, elaborates on the tool-related aspects of bearing shell machining: “The bearing shells are made of GGG 60. The raw part is a sand-cast part with a cast skin, and potentially contains hard inclusions and sand particles. This makes it very abrasive and causes it to behave differently according to the batch conditions during machining. The components are machined in a mere matter of seconds. The first tool in action after loading is a cutter head from the DA system with five cutting edges, a cutting edge diameter of 45 mm (1.7717") and, like the other tools, an HSK C40 holder. The SA4B-grade DA32 indexable inserts are characterised by their universality and high cutting edge stability. Their positive geometry also ensures that cutting forces remain low during work with cast materials. After drilling, finish-boring occurs at the fourth station as part of rough machining. This requires a special tool, which is adapted to the component and process and features ISO cutting inserts with a corner radius of 0.8 mm (0.0315"). After another drilling process, the upper and lower bases are milled at stations six and seven using a compact milling body from the M275 system that is adapted to the machining station, as well as S275 indexable inserts. During this process, the cutting performance is distributed across nine cutting edges. The AS45-grade cutting edges are resistant to the abrasive wear that occurs when cast materials are being used, and their coating is thermally insulating. The eighth station performs the same task as the second station. Two lateral installation points are milled to specific dimensions at station nine, using a DSS end mill with a diameter of 16 mm (0.6299"). The milling cutter – featuring a six-edged geometry that is partially ground in a specific way, and a special helix angle – has a TF2K-grade coating. The tenth station is for finish-boring during the finishing process, using ISO cutting edges with a corner radius of 0.4 mm (0.0157").

Here in the project team, we have really come to know and appreciate one another over the many years that we have worked together and during the 15 or so projects that we deal with annually. I know exactly what Peter Groschupp and Branimir Nikolic require, and both partners are very familiar with the services that HORN offers. We understand each other and we trust each other.”

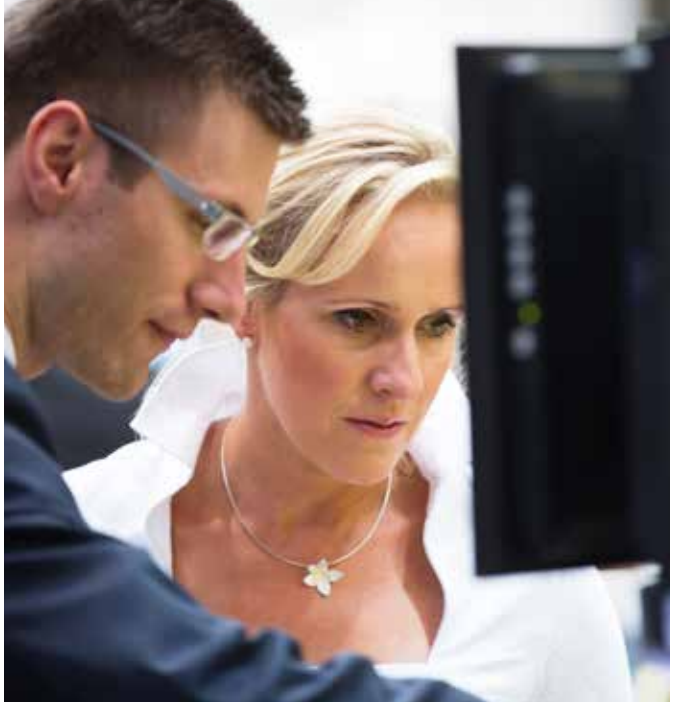
Peak economic performance in the green zone

According to Alfredo Vela, Production Manager at Lupold: “As the tool specialist HORN has been our leading tool partner for many years now, we were already very familiar with the company's work. That's why we immediately gave the green light to Pfiffner's proposal to implement the project using HORN tools. Looking back at the many millions of parts manufactured since then, it was the right decision for everyone involved. In recent years, optimising processes has allowed us to push the limits of the interaction between the machine, the control system, the tools and the clamping system again and again. Advancements in substrates and coatings have led to crucial degressive cost structures that keep our profitability in the automotive industry within very tight margins. Our experience has shown that it is not possible to achieve maximum profitability with processes that are hovering on the edge of the red zone – that is, the less reliable zone. Processes that are firmly in the green zone are stable and economical, do not have any outliers and are able to tolerate material fluctuations. In this respect, we have geared our machine and tool system towards peak performance.”

LEADING THE WAY WITH INNOVATIONS

At the AMB in Stuttgart, HORN will be taking advantage of a revamped stand concept to present its latest products and product enhancements, as well as showcase the latest trends in machining.

The concept uses experience worlds around the stand, which have been specifically designed to create a space that enables contact and dialogue between people and technology. Incorporating areas for sitting, standing, changing places, discussing, and moving around the three-dimensional space, the many levels form a platform for information, live presentations and informal contact – and can even accommodate private meetings in separate areas on the first floor.
Bucking the trend towards entirely digital approaches, the HORN stand will create a sense of interplay that combines products, applications and personal contact with digital support.



More information available at:
www.amb-messe.de

INNOVATION PLATFORM FOR THE MACHINING TECHNOLOGY SECTOR

There are only a few spaces left at AMB 2014, whose focus this year will be on the machines of the future, shortfalls in those employed in STEM careers and composite materials. In 2018, a new exhibition hall will allow more space to be devoted to the event.

For the AMB international metalworking trade fair, which opens its doors between 16th–20th September 2014 in Stuttgart, all the signs are positive. Not only is the economic situation in the German precision tool industry very healthy, but the machine tool sector has also expressed satisfaction over where its business is positioned. And both have their sights set on Europe's leading trade fair for the industry: AMB, which is held in even-numbered years.

Borders with future potential

Approximately 1300 exhibitors from 29 countries are expected, with the largest foreign contingents coming from Switzerland, followed by Italy, Japan, Spain, Taiwan and Austria. Exhibitors from most other European countries as well as Australia, China, Malaysia, South Korea and the USA will also be in attendance, however. 105,200 gross square metres of space will be occupied, meaning that all nine halls of Stuttgart's exhibition centre will be in use. Approximately 55,000 gross square metres of this will be devoted to machines, 35,000 to precision tools, 12,000 to accessories and peripheral devices, and 3000 to the CAD/CAM/CAE sector. More than 90,000 industry specialists from all over the world are expected to attend. The only downside to all these impressive statistics is that there is currently no way of increasing the number of exhibitors due to limited hall space. However, AMB 2018 will see this problem rectified with the construction of another hall, allowing the Stuttgart Messe centre to cover more than 120,000 square metres, accommodate even more exhibitors and meet demands for larger stand spaces. This comes as welcome news to Paul Horn GmbH, as Managing Director Lothar Horn explains: “For the second time in a row, we will be expanding our stand at the AMB vertically rather than horizontally. In 2014, we will be presenting ourselves on three levels and we believe that further growth is on the cards for both our company and the AMB fair. In my opinion, therefore, an additional hall will be absolutely essential for keeping up with future demand.”

Multi-layered and user-focused

The AMB fair will be supplementing the exhibiting companies' presence with user-focused fringe events, as well as providing visitors with additional valuable information. The spotlight will be on the topical subjects of the machines of the future (industry 4.0, virtualisation, complete machining, German engineering, sustainability and resource efficiency), composite materials (material innovations, lightweight construction, new applications and e-mobility), as well as training and specialists, STEM and women in engineering. There will be something to cater to all technical decision-makers and those with production management roles in the mechanical engineering sector, the metalworking and metal processing industry, the automotive and vehicle manufacturing industry, the toolmaking and mould-making industry, as well as metalworking plants.
AMB 2014 is backed by associations with profiles that are an ideal match for the event: the VDMA Precision Tools Association, the VDMA Software Association, as well as the VDW (German Machine Tool Builders' Association).

HORN USA trade fair stand concept for IMTS 2014, focusing on the topic of cooled tools.

West Hall,
Stand W-1722

IMTS 2014
International Manufacturing Technology Show
September 8 - 13, 2014 | McCormick Place | Chicago

OUTLOOK FOR IMTS 2014, CHICAGO

At the 30th outing of the IMTS trade fair in Chicago from 8th–13th September – North America's largest and most important trade fair for mechanical engineers and tool manufacturers – HORN USA will be presenting its latest tool technologies, with a specific focus on the subject of cooling, over a space of 250 m².

Focus on cooling

The growing demand for efficiency in the process of machining modern steel, which features increased strength and toughness, has led to significant advances in the manufacturing of cutting tools. HORN, a leading light in this area of technology, is stepping up to the challenge and developing solutions including a coolant supply method that uses a targeted coolant jet. In addition to cooling via the clamping finger, from the side or from underneath, cooling through the insert directly at the cutting zone has proven to be a highly effective technique. This in turn has resulted particular improvements in tool life and process reliability.

Horn USA, the North American subsidiary of Paul Horn GmbH, will be exhibiting in the West Hall at stand number W-1722. Application specialists with many years of experience will be on hand to take a closer look at machining challenges and make recommendations. Visitors will have the opportunity to find out more about the HORN innovations being presented as well as the existing product range.

IMTS keeps on growing

IMTS 2012 reported more than 100,000 visitors from 112 countries, an increase of 21.6 percent compared to 2010. The exhibition hall at McCormick Place is approximately 115,200 m² in size, and around 1900 companies have presented their products and services there. This year, the organisers are expecting a slight increase in numbers again, in keeping with the motto "Come Together".

"The International Manufacturing Technology Show (IMTS) offers the perfect showcase. It's the largest exhibition and presentation of global manufacturing technologies in the western hemisphere, and the largest meeting of the leading figures who make this possible.
Technological breakthroughs can be found all over the exhibition space. Among the 1900 IMTS exhibitors, you will find the best the world has to offer and the solutions that you need – with around 46,000 square metres of machine tools alone, plus tools and clamping devices."

Investments the future

HORN USA recently expanded its area from 2322 m² to 3716 m². Not only that, but it also increased its technical facilities and machinery with the aim of further promoting its service concept to customers in North America and pushing the demand for large-volume tools. These expansions illustrate the commitment and dedication of HORN USA to the market and the customer-focused approach that is characteristic of HORN.

S100 grooving system in inch dimensions

The S100 grooving system from HORN has been extended to include the groove width of 1/8 inch (3.18 mm), with tried-and-tested geometries and new substrates. A real enhancement to the system is the new S100 grooving insert featuring an integrated coolant supply via the chip surface, ensuring optimum cooling for deep plunge cuts.

The S100 system offers a whole range of geometry and substrate combinations:

- The .EN geometry for high feed rates in the case of medium and high strengths, for deep plunge cuts and parting off with substrate AS6G.
- The .3V geometry for medium feed rates with good chip control, specifically for stainless steels with substrate HP65.
- The .FY2 geometry for low to medium feed rates with good chip control, specifically for stainless steels with substrate Ti25.
- The .E geometry for low to medium feed rates with good chip control, specifically for parting off; light-cutting, substrate AS65.

A cutting insert featuring an internal coolant supply for effective cooling at the cutting zone completes the S100 inch range. The coolant jet acts directly on the cutting zone. The nozzle shape ensures a targeted coolant jet, which aids chip forming and thus reduces the chance of chip build-up. This also considerably reduces the formation of a build-up edge and reduces the wear on the cutting edge. In contrast to conventional cooling, this enables higher cutting parameters along with longer tool life. The holders with internal cooling are available in a right-hand and left-hand design. A screw clamp or self-clamping device permits simple insert replacement with high repeat accuracy.

Increased tool lives thanks to targeted use of cooling lubricant.

25A axial grooving system now also available with 4 mm (0.1575") cutting width

HORN has enhanced the cutting width and diameter of the tried-and-tested 25A axial grooving system with cartridges and round shanks. The cassettes are designed for the standard cassette interface K220 and are compatible with all applicable basic holders from HORN. Supplying internal coolant to the cutting point guarantees efficient cooling and boosts chip flow. Cartridges and boring bars were previously available from an external diameter of 15 mm (0.5906"), with a groove depth of up to 18 mm (0.7087"), and with one-edged or two-edged indexable inserts featuring cutting widths of 2 and 3 mm (0.0787" and 0.1181"). The system has now been expanded to include the 4 mm (0.1575") cutting width. This means that the system can achieve grooving depths of up to 20 mm (0.7874"). Both one-edged and two-edged straight-cutting or full-radius inserts are available now in the additional cutting widths. The .10. geometric shape also ensures reliable chip flow, even with significant slot depths. The cutting inserts have a “neutral” design and can therefore be used in left and right tool holders. They are made of TH35-grade carbide. Holders with diameter increments of 20–25 mm (0.7874"–0.9843"), 25–30 mm (0.9843"–1.1811"), 30–40 mm (1.1811"–1.5748") and 40–50 mm (1.5748"–1.9685") are provided for different slot external diameters.

25A axial grooving system with round shank and cartridge design for 4 mm (0.1575") cutting width.

PRODUCT **INNOVATIONS**

HORN

TRIPLE-EDGED **GROOVING INSERT** WITH CENTRAL SCREW

The new 34T triple-edged grooving insert from HORN is an alternative to the former 312 grooving insert and features additional advantages.

The precision-sintered grooving insert can be used as a neutral insert and as both a left-hand and a right-hand insert. Furthermore, no additional clamping elements, which may have a negative effect on chip flow, are required in the same way as they were before. The grooving insert is centrally screwed into the insert seat using a clamping bolt, creating a precise and reliable connection. For this purpose, and despite the narrow ridge width, a counterbore has been added on both sides of the insert. This is made possible thanks to state-of-the-art pressing technologies in the blank manufacturing process. The screw head that is countersunk as a result does not produce interfering contours and enables reliable grooving even on a collar or directly up to the spindle.

The system allows free chip flow at grooving depths of up to 6.5 mm (0.2560") and grooving widths of 2 (0.0787"), 2.5 (0.0984") and 3 mm (0.1181"); the geometric forms .3, .5 and .D that are currently available are among the features that ensure this. Matching square shank holders are available in a left-hand and right-hand design with dimensions of 16 x 16 (0.6299" x 0.6299"), 20 x 20 (0.7874" x 0.7874") and 25 x 25 mm (0.9843" x 0.9843"). All holders are equipped with internal cooling.

Screw clamped grooving insert type 34T.

Cartridge 845
with internal cooling.

MODULAR **GROOVING SYSTEMS** WITH INTERNAL COOLING FOR STAR TURRETS

The module grooving system from HORN for grooving cartridges based on the system interface 845 consists of

- Base plate for turrets with BMT connection or VDI holder
- Height-adjustable grooving tool holder
- Matching cartridge range with different grooving widths and grooving depths.

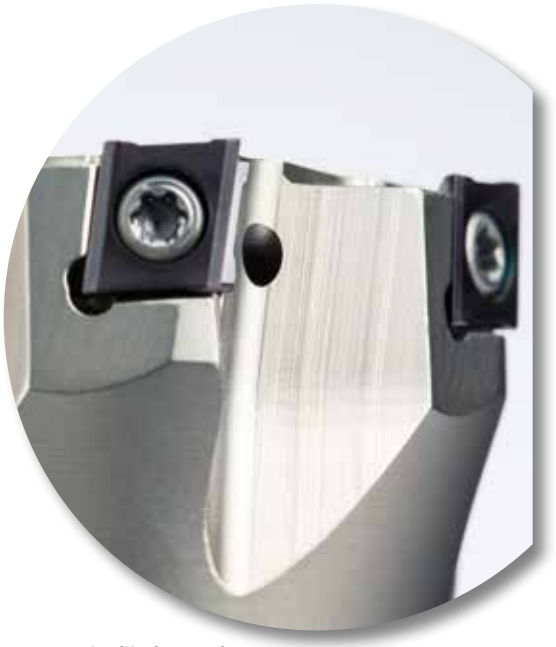
The modular system kit has a selection of base plates for turrets with BMT connections, based on standard machine types. Alternatively, VDI basic holders are available in various sizes.

The matching grooving tool holders with integrated coolant supply allow the cartridge heights to be adjusted and their fastenings to be set in a normal or overhead position, on the left or on the right of the grooving tool holder. The cartridge system with system interface 845 serves as the holder for the S100 grooving insert system with a range of geometries and substrates. Grooving widths of 2.5 (0.0984"), 3 (0.1181") and 4 mm (0.1575") are available with grooving depths of 22 (0.8661") to 105 mm (4.1339"). The cartridges are equipped with an integrated coolant supply in versions for clamping finger and support cooling. The system offers a higher level of rigidity compared to cut-off blades and enables planar parting-off surfaces, even with large material diameters. The flat design prevents unnecessary interfering contours.

CT INNOVATIONS

MILLING SYSTEM WITH PATENTED TANGENTIALLY SCREWED INDEXABLE INSERTS

The patented HORN tangential milling system has been extended to include another milling range. The new 406 milling system – featuring a four-edged rhombic indexable insert – is designed as an end-milling range for smaller cutting edge diameters. The milling shanks with DIN 1835-B holders are available with cutting edge diameters of 16 (0.6299"), 20 (0.7874"), 25 (0.9843"), 32 (1.2598") and 40 mm (1.5748"), and come equipped with two to six 406-type cutting inserts. The precision-ground rhombic indexable inserts achieve a high level of precision with very good surface quality levels. Positive cutting and axial angles enable a soft cut. The secondary cutting edge with integrated trailing chamfer produces outstanding face surfaces. An additional free-formed surface chamfer provides a stable wedge angle and a very smooth milling process. The indexable inserts in carbide grade AS4B, a tough basic substrate, are coated with TiAlN. “Projections” attached to the cutting inserts also produce an improved relief angle for the individual secondary cutters and, furthermore, provide extra protection on the flat side for the main cutting edge, which is set back in this case. The cutting inserts with a corner radius of 0.4 mm (0.0157") achieve cutting depths of up to 6.3 mm (0.2480") and are suitable for milling exact 90° shoulders. The entire cutting length can be used during this process.



406 end mills for cutting depths of up to 6.3 mm (0.2480").

NOVATIONS

INTERNAL GROOVING WITH SYSTEM 216

The new system 216 from HORN is designed for internal grooving in holes of 20 mm (0.7874") diameter and above. The tools consist of tool holders with internal cooling and two-edged indexable inserts with a cutting width of 2–6 mm (0.0787"–0.2362"). The precision-sintered indexable inserts, made from the substrate AS45, are available in two different geometry versions. Geometries .5 and .1A ensure improved chip control and chip breaking, even with long-chipping materials. The tool holder is available in standard shank diameters of 20 mm (0.7874") and above. These have a groove depth of 7 mm (0.2756") at a projection length of 2 x D. Tool holders for g6-quality shanks are available in a left-hand or right-hand design with internal cooling. Together, the two cooling lubricant jets remove chips from the internal area of the tool in a controlled, efficient manner.

System 216
for internal grooving.

Type 105 cutting inserts for machining hard materials up to 66 HRC.

SUPERMINI® TYPE 105 FOR HARD MACHINING

The Supermini® type 105 tool system from HORN performs demanding tasks involving hole diameters between 0.2 mm (0.0079") and 6 mm (0.2362"), with well over 1000 cutting insert versions.
The new type 105 cutting inserts for machining hard materials up to 66 HRC are available for hole diameters of 4 (0.1575") and 5 mm (0.1969"), and hole depths of 10 (0.3937") and 15 (0.5906") or 15 (0.5906") and 20 mm (0.7874"). The cutting inserts are available in a left-hand and right-hand design. The coating, which is resistant to high temperatures, is precisely coordinated with the carbide substrate used and the microgeometry of the cutting edge. As a result, this perfect combination of carbide substrate, coating and adapted cutting edge geometry offers a highly cost-effective alternative to the CBN cutting materials that were required before now. The cutting inserts fit all HORN standard holders for the Supermini® type 105.

NOVATIONS

NEW CUTTING INSERTS AND HOLDERS EXPAND THE 409 TANGENTIAL **MILLING CUTTER SYSTEM**

The patented M409 tangential milling cutter system from HORN, unveiled at EMO 2013, is equipped with rhombic indexable inserts.
Cutting inserts with corner radii of 0.4 (0.0157") and 1.2 mm (0.0472"), also in grade AS4B, are new additions. The precision-ground rhombic indexable inserts achieve a high level of precision with very good surface quality levels.
Additional holders are also new features of the 409 system. 45° and 60° milling cutters as well as indexable insert end mills and side milling cutters have been added.
The 45° and 60°-milling cutters with cutting depths of a_p = 6.2 mm (0.2441") and 7.7 mm (0.3031") can be used with the same R409 indexable inserts. Both milling cutter models are available as arbor milling cutters with DIN 8030-A holders and internal cooling, in diameters of 40 mm (1.5748"), 50 mm (1.9685") and 63 mm (2.4803").
The five-row indexable insert end mills with a cutting depth of a_p = 43.2 mm (1.7008") and DIN 8030-A holders also use the same indexable inserts. The holders with internal cooling are available in diameters of 40 mm (1.5748"), 50 mm (1.9685") and 63 mm (2.4803").
In addition, the 409 system has been expanded to include the side milling cutter with DIN 138 driver slot. As well as the R409 indexable inserts, new indexable inserts in a left-hand design with an L409 cutting edge corner radius of 0.8 mm (0.0315") are also used in this system. Available cutting edge diameters are 100 mm (3.9370") and 125 mm (4.9212"), with cutting widths of 14 mm (0.5512") and 18 mm (0.7087").

Indexable insert end mills for milling system 409.

Double-edged grooving insert with 3 mm (0.1181") cutting width and internal cooling.

S224 **CUTTING INSERT** WITH INTERNAL COOLING

The HP65-grade S224 cutting insert with internal cooling, featuring the .3V geometry and a 3 mm (0.1181") grooving width, is a new addition to the HORN range. Its wear-resistant AlTiN coating is specially designed for grooving and parting off stainless steels. The cutting insert with 3 mm (0.1181") cutting width and an internal coolant supply expands the areas of application that the cutting inserts from the S224 range have been suitable for up to now. The coolant jet acts directly on the cutting zone, thus ensuring optimum cutting conditions at this point. The funnel-shaped nozzle creates a coolant jet, which supports chip forming and thus reduces the chance of chip build-up. Furthermore, this type of internal cooling largely prevents the formation of built-up edges and break-outs on the cutting edge. Unlike conventional cooling methods, this system achieves higher cutting parameters, which allow the tool to be used more cost-effectively. The square shank holder with internal cooling is available in dimensions of 16 x 16 (0.6299" x 0.6299"), 20 x 20 (0.7874" x 0.7874") and 25 x 25 mm (0.9843" x 0.9843"), in a right-hand and left-hand design. The coolant is transferred via a slot at the bottom. The holders are compatible with the relevant VDI supports. The screw clamping device of the cutting inserts with stop allows the cutting inserts to be replaced easily with a high level of repeat accuracy.

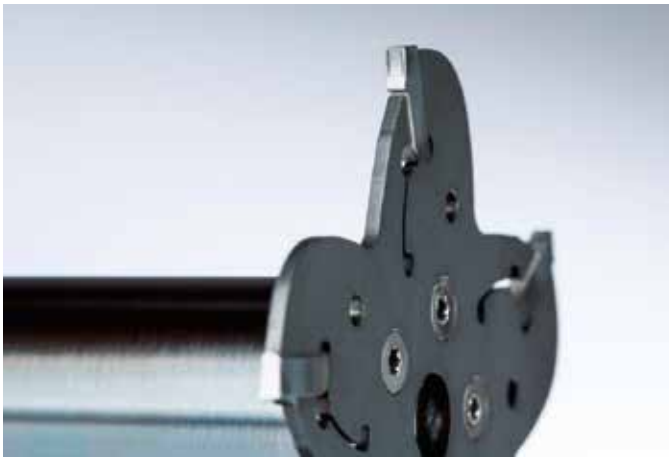
NOVATIONS

Hartmetall-Werkzeugfabrik
Paul Horn GmbH
Postfach 17 20
72007 Tübingen, Germany
Tel.: +49 7071 7004-0
Fax: +49 7071 72893
E-Mail: info@phorn.de
www.phorn.de

Extended M101 slotting cutter range

The M101 milling and slotting cutter range from HORN featuring self-clamping cutting inserts and cutting edge diameters of 80 to 200 mm (3.1496" to 7.874"), as well as slot widths between 1.6 and 4 mm (0.063" to 0.1575"), has been expanded downwards to incorporate the 63 mm (2.4803") cutting edge diameter. The milling cutters are fitted with five cutting inserts in 1.6 mm (0.063") and 2.0 mm (0.0787") cutting widths. This allows slot depths of up to 19 mm (0.748") during the milling process. A cylindrical shank measuring 25 mm (0.9843") in diameter and with a Weldon DIN 1835 B interface provides the holder. The AS45-grade cutting inserts are available in either a straight-cutting design with .3 geometry or a full-radius design with .E3 geometry. The geometries are particularly suitable for standard steels, stainless steels and titanium materials.

Replacing the cutting inserts is a simple, highly precise process: the clamping finger is lifted in the insert seat using a chuck key, allowing the cutting insert to be removed and replaced. During the process, the chuck key is held securely in the main body so that it cannot slip out. The precision-milled prism in the insert seat ensures a secure connection with a high level of repeatability thanks to a stop in the main body.



Slot milling of diameters measuring 63 mm (2.4803") and up.

DG exchangeable head milling system with internal coolant supply

Targeted cooling even when milling with the DG system.

The modular milling system with quick-change interface for corner and slot milling, chamfering, as well as copy and high-feed milling of steel materials is now also available with the internal coolant supply. The carbide exchangeable heads, available in three sizes with 10, 12 or 16 mm (0.3937", 0.4724" or 0.6299") diameters, have a central coolant hole with a coolant outlet on the front edge for effective cooling lubricant and reliable chip transport away from the cutting zone. The internal coolant supply is especially advantageous during slot milling operations. The rigidity, concentricity and efficiency of the two-piece design, made up of the shank and exchangeable head, make it a winning choice. The exchangeable heads are available in various designs with corner chamfer, corner radius or sharp corner cutter and in any customer-specific geometry. All carbide shafts are fitted with an internal coolant supply as standard. The heads themselves are made up of two parts: a steel connection and a carbide cutting head.

DCX solid carbide slot millers with expanded dimensions

The DCX solid carbide slot milling system has been developed as an addition to the circular milling system with exchangeable inserts and 3 or 6 cutting edges. It comes with the advantage of increased slot depths when using cutting edge diameters of 20 mm (0.7874"), 25 mm (0.9843"), 30 mm (1.1811"), 35 mm (1.3780") and 40 mm (1.5748").
In the future, the product family will add longer shaft lengths and wider profile widths designed according to customer specifications. HORN developed the DCX solid carbide millers especially for circular milling of deep and narrow slots in steel and stainless steels. One of their areas of application is manufacturing surgical instruments and forceps. HORN grade AS45 is used as the cutting material. It is characterised by a long service life and low cutting forces, especially when milling steel and tempered steels.

DCX with longer shaft lengths and profile width for special applications.

The exceptional product characteristics of these DCX solid carbide millers include:
- Increased slot depths of up to 15 mm (0.5906") for D = 40 mm (1.5748")
- Large chip areas for preventing chip blockage
- HORN-specific cutting geometry for easy cutting
- Adjusted number of teeth for high cutting performance with low power consumption
- High-performance TiAlN coating for slot milling applications

As well as this, additional customer-specific solutions are available with the following maximum dimensions:
- Shaft length of up to 140 mm (5.5118") for very deep holes
- Profile width of up to 10 mm (0.3937") and slot depth of up to 15 mm (0.5906") for D = 40 mm (1.5748")
- Profile width of up to 8 mm (0.3150") for D = 25 mm (0.9843")
- Tool design according to customer requirements where diameter, profile shape, profile width and shaft length are concerned.

DAH25 high-feed milling system enhanced

End mills with a 3 x D design and screw-in heads for the existing SA4B-grade DAH25 indexable inserts have been added to the DAH25 tool system for high-feed milling.
All tool holders with cutting edge diameters of 12 (0.4724"), 16 (0.6299"), 20 (0.7874") and 25 mm (0.9843") are designed for internal cooling and fitted with two, three or four indexable inserts depending on the diameter. A TiN coating protects the holder against corrosion and chips.
The indexable inserts, each with two cutting edges, are securely clamped using a screw. The specially precision-sintered chip surface geometry and the large cutting edge radius on the front side ensure a soft cut and minimum stress. A small cutting edge radius on the inside ensures quick and reliable plunging.
The latest high-feed milling cutter models are ideally suited to deep cavities. The indexable insert geometry results in an favourable load in the axial direction of the tools, which means that very high tooth feed rates can be achieved even in the case of tools with this longer throat depth. The tough SA4B substrate is suitable for milling steel, stainless steel, cast iron, aluminium and titanium.

End mills and screw-in heads enhance the DAH25 high-feed milling system.

DS aluminium range

As a result of expanding the HORN solid carbide endmills range to include the DS system, in the future a broad range of DS endmills will be available, especially for applications that require aluminium, non-ferrous metals and plastics to be machined. The standout features of these solid carbide endmills will be their optimized geometry and polished cutting edges. They will be available in the following dimensions:

- Micro-ballnose endmills, micro-torus endmills and sharp-edged micro-milling endmills available in diameters from 0.1 to 3.0 mm (0.0039" to 0.1181") and with an effective length of 3.0–7.0 x Ø.
- Ballnose endmills and endmills with corner radius or sharp edge available in diameters from 4.0 to 20.0 mm (0.1575" to 0.7874") and with an effective length of 3.0–7.0 x Ø.
- Coated roughing endmills with ripper profiles and high-feed endmills, with precision balancing and internal coolant supply available in diameters of 6.0–20.0 mm (0.2362" to 0.7874").
- Single fluted endmills, also suitable for drilling, available in diameters of 0.3–12.0 mm (0.0118" to 0.4724").

Milling cutters for aluminium machining with polished cutting edges and optimised geometry.

Diamond cutting, CVD thick film and PCD-tipped

The cutting material CVD-D is significantly more resistant to wear than PCD. The reason for this is that CVD-D does not have a metallic binding chamfer, resulting in a diamond content of almost 100 percent.
With PCD, the metallic binding chamfer generates a certain toughness. Very high kinematic forces, strong variations in stress and undefined inclusions in the material are criteria that support the use of PCD-tipped cutting bodies and ensure process reliability. The specially developed chip shape geometries .HN and .HS prevent snarl chips that may jeopardise the process when working with any aluminium alloy – even in dry machining.
The ISO range offered from stock covers the most common basic shapes and dimensions, each with screw clamping. The precision engineering of the carbide main bodies (G grade) and the universal design of the screw counterbore ensure that it can be used in all standard holder systems.
The cutting inserts can be used in turning tools, spindle tools and milling tools, as well as in wiper geometry, whole cutting edge and full-face equipment versions.

Cutting inserts with diamond cutting edges suitable for turning and milling.

A look back at METAV in Düsseldorf

While METAV 2014 may have invited mixed opinions in its run-up, HORN came away with a thoroughly positive impression of this trade fair. A total of 31,000 visitors made their way to the exhibition ground in the German city of Düsseldorf. In addition to its own stand, which stretched across 80 m², HORN was also represented at the special stand “Metal meets Medical”, with tool solutions for the medical technology sector. Markus Kannwischer, Technical Director and member of the HORN Management Board, gave a presentation at the neighbouring podium on “Current machining solutions from the medical technology sector”, as well as speaking at the METAV “Sustainable Machining Processes” technology forum. His talk here, entitled “A brilliant solution: Task-oriented cutting materials”, took an in-depth look at machining using diamond tools. “Once again, the METAV trade fair proved that it is an important venue for cultivating business relationships between production engineering manufacturers and their customer industries,” said Dr Wilfried Schäfer, Managing Director at METAV organiser VDW (German Machine Tool Builders' Association).

A look back at Tube® in Düsseldorf

More than 2500 international exhibitors from the cable, wire and pipe industries are reflecting on five successful days at this trade fair event. Inspired by the upturn in the steel economy in 2014, the companies exhibiting at the Düsseldorf trade fair grounds showed off their product innovations at not one, but two fairs: wire 2014 and Tube® 2014. 72,000 industry specialists from 104 countries got the latest on the current industry trends at the events, which lasted from 7th–11th April. In HORN's case, the focus was on oil field pipe machining. In addition to offering special tool solutions in this sector, the company is also API-certified.

A look back at Südtec in Stuttgart

The sixth annual Südtec trade fair is set to take place in Stuttgart between 21st–23rd April 2014. This trade fair also serves as the supplier fair for MEDTEC, which takes place at the same time. Alongside its extensive milling cutter range, HORN will be there to showcase its whirling and grooving tools that are designed specifically with the medical industry in mind: since this industry demonstrates almost constant annual growth of around five percent in products that require machining, HORN also reports a trend that is in line with this. The medical technology sector is one of the largest consumer industries alongside the automotive and mechanical engineering sectors.

Tony Asplund, Sweden Sales Manager

> The Swedish market is very welcoming of new tool solutions.

TONY ASPLUND ON HORN'S NEW PRESENCE IN SWEDEN

HORN Sweden came into being on 1st January 2013. So how has "Project Sweden" been going?

HORN products have been represented on the Swedish market since as far back as 1984. At that time, though, they still came through a sales agency. HORN is already a well-known brand in Sweden as a result – but the number of customers and the order volumes have increased significantly since we opened our doors on 1st January 2013. We get new customers every week. Even though the Swedish market is still recovering from an unfavourable 2009 and 2010, it has achieved especially good growth in the last year and a half – so I'm optimistic for the future.

Which sectors mainly make up the Swedish customer base?

We're mainly involved in the automotive, hydraulics and pneumatics, electronics, and medical technology sectors, as well as their supplier industries.

What are the characteristic features of the Swedish market?

The cutting tool market does very well in Sweden as a direct result of companies like Volvo, Scania, Atlas Capco, Siemens and others. However, we're working in a seriously competitive environment. Since becoming more active in the series production sector, we have found that the demand for special and combination tools has increased. As well as this, the HORN GreenLine philosophy – which ensures delivery of special tools within five days of drawing approval – scores highly with our customers.

Which HORN strengths or HORN products are particularly advantageous?

HORN products really show off their strengths when it comes to machining between two flanks. However, the HORN product portfolio also offers ideal solutions in applications with challenging technology requirements – thanks not only to the standard tools that the company offers, but also the large variety of special tools that represent as much as 30 to 40 percent of our solutions. The Mini and Supermini® product lines are in very high demand on the Swedish market. But grooving, broaching, reaming and milling are showing significant growth rates too. There is also HORN's well-established consultation service, which our customers really value, as well as the GreenLine philosophy that I already mentioned.

In the German automotive industry, there is a lot of talk about new materials, especially carbon – is this a hot topic in Sweden, too?

The Swedish market is very welcoming of new tool solutions, particularly as a means of reducing production costs and increasing quality. If we don't see continual improvement in this field, there is the risk that production will migrate to countries with lower labour costs. Where new materials are concerned, I don't see a danger of this happening to such an extent as yet, but it is absolutely vital that we provide the tools to accompany advancements in technology and continually push boundaries.

Sweden – a country of many talents, including machining.

A BREATH OF FRESH AIR IN SWEDEN

Sweden is a parliamentary monarchy covering 438,575 km² and has around 9.6 million inhabitants. It is a country that benefits from significant natural resources such as iron ore, copper, lead, zinc, silver and gold. In addition to mining, agriculture and forestry are also traditional branches of Swedish industry. However, the services industry, which has been under constant and intensive development in recent decades, contributes the largest amount to the gross domestic product. On the industrial side of things, well-known automotive and utility vehicle brands shape the country's profile, as do the medical technology sector and the hydraulics and pneumatics industry.

Finger on the pulse

JR Tool has already been HORN's Danish representative for many years. Following positive experiences with HORN tools in Denmark, JR Tool founded the Swedish subsidiary in 2013. This young company has a well-established market to provide it with support: Paul Horn GmbH started selling its products to the Swedish market via a trading company back in 1984. HORN Sweden is located in Örebro – around 200 kilometres west of Stockholm – and has been acting exclusively for the local market since 1st January 2013.

HORN Sweden currently consists of six employees, two of whom are based in the office and take care of orders, logistics and so on. There are then four sales engineers working in the field, although this number is set to increase in the near future. In Denmark, the company employs twelve members of staff. Strictly speaking, the HORN teams in Denmark and Sweden form a single unit; a fact that is also reflected in the company's official name: HORN Sverige & Danmark – Powered by JR TOOL.

The JR TOOL headquarters in Vejle, Denmark.

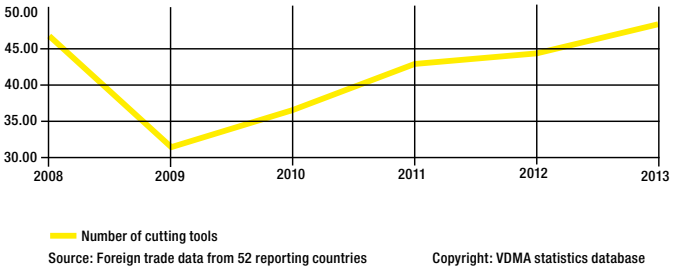
The Swedish/Danish team: Jan Eilenberg, Tony Asplund, Rudy Bonde, Johan Norrena, Johann Berqvist and Kaare Blak (from left).

The on-site employees have experience of working in the precision tools sector and are familiar with the market and customer mentality. They also uphold HORN's fundamental values of absolute customer focus, quality, speed and support – all important requirements for long-term customer retention and success. In Sweden, just as in Germany, it holds true that identifying the best solution comes from a discussion with the customer in the spirit of partnership, and as much analysis of the facts as is necessary.

Asplund goes on to say: "The MAX trade fair in Stockholm in March of this year was an excellent platform for showcasing our team and the HORN product range to the public. The response from the Swedish visitors was also very positive. Many people now have an insight into the solutions that HORN has to offer, but this event was the first opportunity to show this to them."

All signs point to growth

The Swedish economy was among the victims of the 2009 financial crisis, and the effects can still be felt today. The market is still currently in recovery, and this is something that also applies to exports of cutting tools from Germany to Sweden. In 2013, however, the industry was able to not only return to 2008 levels, but also improve upon them – and yet more growth is anticipated for the near future. "We are also estimating this on the basis that we have received positive signals from our customers, suggesting that production volumes among them are set to increase again over the next six months," says Tony Asplund, Sweden Sales Manager.



Exports from Germany to Sweden: Selected goods.
Cutting tools in millions of euros.

A special gear in an aluminium component with high silicon content is milled using a long throat depth.

M121 GEAR MILLING CUTTER PAYS FOR ITSELF AFTER TWO MONTHS

Special tasks require special solutions.

Otto Beckert GmbH in Kirchentellinsfurt, Germany, was on the hunt for a special solution – and it was on the HORN website that it found the answer. Since then, a specific gearing problem has been solved with a high level of process reliability by using an M121 module milling cutter featuring carbide cutting inserts. And this Internet discovery paid for itself after just two months.

The Kirchentellinsfurt company Otto Beckert Feinmechanik und Vorrichtungsbau GmbH was founded in Tübingen, Germany, in 1977. This one-man operation quickly grew to 20 employees, with the machinery to match. A new headquarters in a former dye factory in Kirchentellinsfurt provided the space required for further growth. Today, Beckert employs 32 staff and has more than 15 ultramodern, high-capacity machining centres. Beckert is a typical contract manufacturer whose identity is closely linked to its home region of Swabia, and it places high demands on the precision and complexity of its products.

A contract manufacturer with a demanding profile

The range of materials that the company machines encompasses steel in both the tempered and hardened varieties, aluminium, high-strength aluminium alloys for the aerospace industry, plastics (including fibre-reinforced kinds), titanium, stainless steels such as 1.4571, and non-ferrous metals. From these materials, it creates

The M121 module milling cutter from HORN, equipped with six carbide cutting inserts, brilliantly took over from the previous HSS milling cutter.

its own products such as three-phase motors for jewellery and dental polishing units, as well as other types of three-phase and alternating current motors. This represents around 20 percent of the turnover. The remaining 80 percent comes from machine components, precision parts, both complex and simple and in quantities from 10 to 1000; modules for linear motors used in adjustable valve control systems; and clamping devices for the optical industry, carbon fibre machining, machine tool manufacturers and the medical technology sector. From individual parts to modules and all the way through to complex, ready-to-install systems with electronic components – Beckert's motto is “Der Beckert macht's”, which roughly translates to “Beckert can do it”. And it does it all with a philosophy of reliability that's firmly rooted in the Swabia region: 80 percent of the specialist staff were trained in-house at Beckert.

Beckert received an order for the complex turning and milling parts sector that required the company to custom-build a piston system designed to translate a hydraulically induced linear motion into a defined rotating motion, using two internal tooth bars moving in opposite directions. The material in this case was a cast aluminium alloy with a high silicon content, while the piston diameter and height required were 250 mm (9.8425") and 270 mm (10.6299") respectively. The company manufactures a range of system pistons several times a year, in batch sizes of between 50 and 100 units. Standard HORN grooving tools are used for machining the sealing and guiding slots on these components. In this case, however, the gear teeth presented a problem in that they consisted of eight toothed strips of 190 mm (7.4803") in length in module 5.

The solution: An Internet find

Given the expense associated with solid carbide module milling cutters and regrinding, up to now gear teeth had been machined during the finishing process using HSS module milling cutters. An M310 side milling cutter from HORN with a diameter of 100 mm (3.9370") and a cutting width of 3 mm (0.1181") was used for rough milling. Rough milling was therefore carried out in a central cut and two flank cuts with a milling cutter set at 20°. However, finish milling using the HSS module milling cutter in multiple passes was time-consuming, cost-intensive and, after ten parts, no longer reliable. According to Managing Director Ralf Beckert: “We were having to make readjustments, the cutting pressure was getting higher and higher, and the surface was getting worse and worse. We were desperately looking for a new solution. But despite my extensive research, I just couldn't find module milling cutters with module 5 fitted with carbide cutting inserts. Back then, HORN didn't have a gear milling cutter with module 5 in its range: it wasn't until the EMO 2013 trade fair that this was unveiled, which is why I hadn't discussed it with the HORN field sales team. It was around the same time as EMO that I stumbled across the new M121 system on the HORN homepage, so I got in touch with HORN.”

Paying for itself after just two months

Rough milling at Beckert is still carried out in the same way using the M310 side milling cutter – but now, finish milling uses a HORN M121 milling cutter that offers more than four times the tool life, twice the feed rate and a higher cutting speed than

the HSS system. As Ralf Beckert reports: “This milling cutter has given us substantial cost advantages, along with excellent process reliability and the best possible surface quality – a huge plus when a part is expensive to pre-machine. Storage costs have been reduced to a minimum: we now only need to stock a month's supply of cutting inserts. Although our cutting inserts have a customer-specific special geometry, HORN delivers them to us within the space of a week. According to my calculations, this investment paid for itself after just two months and approximately 200 parts.” A stable shank enables milling with an extensive throat depth – no less than 210 mm (8.2677"). The arbor milling cutter holder from HORN features internal cooling, while six teeth on the circumference ensure large chip spaces. The milling cutter also operates incredibly smoothly. The geometry of the customer-specific cutting inserts is precision-ground from a standard blank. The AS45-grade cutting inserts are tough and wear-resistant with a coating that provides excellent thermal insulation. They are fixed with a Torx 20plus screw, with the screw pulling the cutting insert both radially and axially against a stop with a high level of indexability.

Ralf Beckert states: “As our products and workpieces have become more and more sophisticated and we have required higher-quality, more universal as well as more specialised tool solutions, we have benefited from a partnership with the manufacturer HORN over many years. About seven years ago, we took this partnership to the next level. We use a wide range of HORN tools for parting off, grooving (both internally and externally, as well as axially and radially), broaching, side milling – and now gear milling too.”

Extensive gear range up to module 6

With the expansion of the gear cutting systems up to module 6, HORN now offers integrated tool systems for all module sizes from M 0.5 to M 6. The gear range comprises
- Milling spur gears
- Milling shaft/hub connections
- Broaching internal toothing
- Milling worm shafts
- Milling customer-specific gear profiles

Depending on the module size (DIN 3972, basic rack profile 1), there are various
milling systems for the area of application:
- Up to module 3: cutting inserts of type 606 to 636 (also as triple cutters)
- Up to module 4: M274 and M279 milling systems – single-row and two-row for wide profiles
- Up to module 6: the new M121 milling system

The 613 design – a new addition to the catalogue range for module 1 and module 1.5 (DIN 3972, basic rack profile 1) – offers some key advantages. At a diameter of only 21.7 mm (0.8543"), six teeth ensure short machining times for machining gears on shafts even if there is limited space available. The carbide grade AS45 opens up a wide range of applications, with exceptional tool lives.

Rainer Saile, field sales advisor at HORN (left), and Managing Director Ralf Beckert: “HORN is an innovative company and a very important partner for us at Beckert.”

Markus Kannwischer has been with the company since 2008. He has been Technical Director since coming on board and is a member of HORN's Management Board.

TECHNICAL TRENDS, DEVELOPMENTS AND MARKET REQUIREMENTS

Where do you see challenges being presented today?

Currently, in the tool systems sector we're seeing a clear trend towards internally cooled grooving tools. As a result, we've already begun shifting our extensive grooving range to internally cooled versions – including the S100 grooving insert featuring integrated chip surface cooling, which achieves better cooling lubricant effects than grooving systems with external cooling, especially during deep plunge cutting. Cooling and lubrication are currently showing developments in opposite directions: on the one hand, minimum lubrication is becoming popular, especially in the automotive sector; but on the other hand, the cooling lubricant pressure levels available for machine tools are significantly increasing. Where materials are concerned, high-alloy steels – particularly of the stainless variety – seem to be the name of the game. And of course, the trend towards product-specific special solutions is showing no signs of slowing down. Cycle times in series production are dropping to a very favourable extent. In some cases, the components being manufactured are so complex that only special tools can provide the right solution for the machining task.

And what challenges can we expect to face in the future – in other words, what machining trends will we be seeing?

New coating technologies offer very promising approaches in combination with new coating elements. However, cutting materials also offer potential for further advancements in performance, and carbide is leading the charge. The multitude of materials will continue to increase – and there are already signs of this in the cutting materials sector. In the diamond cutting material range alone, we have three different cutting materials that are largely distinct from one another, in the form of MCD, CVD-D and PCD – and those are in addition to the diamond-coated solid carbide tools. This creates a very wide field, and one challenge for us will be focussing on our specialisms whilst expanding our product range in other areas at the same time.

How will these changes affect the HORN product range?

The product range is set to expand and diversify. On the one hand, we're continually making technical optimisations to our existing products over their life cycles, with the goal of increasing their engineering quality even further. On the other hand, our customers bring requests and demands that lead us to create new ideas and products.

HORN is known as a problem-solver – how does this help you to score points with series manufacturers?

Generally, they praise the fact that impressive solutions we have developed in the past can be carried over to the jobs of the future

too. Series manufacturers are under particularly high pressure to make continual improvements in ongoing processes. Our task is to scrutinise the existing solutions and ensure that the new ones we provide will ensure a profitable step forward. Besides creativity and technical skill, speed also plays a role when it comes to creating new products, since in many cases there is very little time between receiving an order and delivering the tools. The challenge here lies in responding immediately with a practical, efficient solution that allows series production to run according to plan.

Technology determines costs – how does that manifest itself?

It's still the case that increasing productivity and securing technological leadership are what give you the ability to compete in an environment of globalisation. Merging machining operations into one cutting insert in the form of a special tool, or combining different cutting inserts to create a single tool that cuts down on the need for tool replacements or enables simultaneous machining processes, recognises something that is still as true in the machining sector today as it was in the past: Time is money. With that in mind, reducing machining costs is the goal.

What factors determine whether a product will be successful?

The three factors of price, performance and quality apply to the cutting tool sector too. Output levels, and ensuring a healthy order situation, have to be considered in terms of not only tool life, but also time – that is, machining time. Achieving maximum production levels with the machinery available and reducing machining times are the objectives here, and the requisite quality has to be guaranteed at the same time. However, the success of a product also depends on when it is launched on the market: the tool must offer genuine added value compared to existing solutions and must help improve efficiency in the machining process.

How do new products come about – is it a case of free-thinking or market and customer analysis?

Successful products often come about as a result of dialogue with our customers: they know the tasks, we know what we can do, and we know that we can enhance what we provide if necessary. Let's take pipe fitting machining as an example. For decades, dies were made of solid carbide. Our field service team had a look at this area and asked whether HORN had anything that could cater to it. Our research department contemplated this, and the result was a product whose success on the market surprised even us.

And what's your role in creating products?

I'm the intermediary between requests from the sales department, or ideas from the engineering department, and what is actually needed to make these feasible. When a product reaches a certain level of maturity, I take the time to critically examine things and make suggestions.

In your opinion, what makes a good precision tool?

For a cutting tool to be really good, its technical limit must be set just that bit higher, and it must have the aim of achieving a level of machining process reliability for which there was previously no solution.

Markus Kannwischer explains how HORN tangential tools are created.

Carbide blanks for wear parts and round tools.

WEAR PARTS: STATE-OF-THE-ART PRODUCTION FOR THE MARKET OF THE FUTURE

Horn Hartstoffe GmbH boasts state-of-the-art facilities that manufacture carbide wear parts; that is, non-cutting parts which are produced using direct or indirect shaping elements such as hydraulic elements, nozzles, guide bars or wire guide rollers for wire eroding machines. These parts are typically suited to a wide range of applications, and in recent times, demand from the toolmaking, automotive and oil field sectors, as well as the food and power tool industries, has increased significantly.

The current market demands quick response and delivery times, and the key products are not only mass-produced parts, but also complex ones. This gives rise to both standard products such as rods with profiles in all kinds of shapes, and custom-built solutions, which HORN staff members design exactly in line with customer specifications.

HORN's focus is on complex components, with a large number manufactured in-house. Thanks to the four shaping processes of axial pressing, extrusion, injection moulding and dry-bag pressing, coupled with high-performance turning and milling machining processes, it is always possible to find exactly the right technique for the job at hand. For example, electric axial presses, with their six transverse press modules that act horizontally, create complex shapes using an automated work process, which results in efficient production. Customers also benefit from this in-house manufacturing: the whole added-value chain – from the preparation of feedstock through to final sintering – is located at HORN, as is grinding and coating work.

The company's focus on service provision is given equal weight. Experienced field sales employees provide on-site consultation to customers, and this service also includes the individual selection of the carbide grades to be used, the design proposals as well as the coatings. Cooperation that takes place in a spirit of partnership, and intensive contact with the customer, are vital to HORN's work, as the best results are achieved when all the relevant information can be obtained through consultation with the customer.

HORN believes that the carbide wear parts market has good prospects for growth. As these parts are used in an almost unimaginable range of applications, they must meet stringent quality demands relating to aspects such as pressure resistance and corrosion resistance. Customers demand short lead times and excellent reliability when it comes to delivery – and HORN has what it takes to stand up to these challenges. Not only that, but the company is driving forward its efforts even more as a means of accommodating every customer requirement.

Michael Kast, field sales employee in the area of wear parts, examines an axially pressed cutting insert.

FIRST CERTIFIED MMS TOOLS TESTED

Minimum-quantity lubrication technology, also known as MMS for short, is used in many production processes. It has now inspired a joint project too – with HORN, a specialist in high-tech machining applications (particularly slot machining as well as grooving and parting off), on one side of the partnership; and on the other, HPM Technologie, a company based in Münsingen, Germany, and specialising in building state-of-the-art MMS systems and producing its own MMS fluids.

The project has resulted in a design for basic holders that are compatible with MMS technology. In order to document the MMS properties, the holders were tested using an HPM-defined test protocol. MMS properties such as pressure, flow rate and exit geometry were some of the aspects under scrutiny.

HPM confirmed that the first H100 and H224 MMS holders had excellent MSS properties, and these were then certified after the test had been passed. When put into operation following this, the tools demonstrated a 30 percent longer service life than a non-optimised MMS tool.

The cooperation between HPM Technologie in Münsingen and HORN is set to continue, with the next step aiming to convert the special holders into an MMS tool range. These holders are also expected to be certified for MMS suitability by HPM.

HPM Technologie GmbH
sprühen • tropfen • fluids

ZERTIFIKAT

Werkzeug:	Klemmhalter H224.2525.0876
Werkzeugeinsatz:	Drehen
Hersteller:	Paul Horn
Prüfverfahren:	HPM Norm zur Prüfung von Werkzeugen unter Laborbedingungen ohne Spanabtrag
Anlagenversion:	HPM Breeze LSJ-Z30
Medium:	HPM Pimos AL + ST
Prüfparameter:	- MMS gerechte Geometrie - Funktionsprüfung Durchfluss unter versch. Druckstufen (optimal / gut / bedingt / ungeeignet)

Prüfergebnis:

MMS gerechte Geometrie

Austrittsöffnung IK:	optimal
Kühlkanalaustrittswinkel:	optimal
Kühlkanalgröße und Übergänge:	optimal
Schneidenbenetzung:	optimal

Durchfluss unter verschiedenen Druckstufen

Bis 6 bar Druck:	bedingt
Ab 6 bar Druck:	optimal
Generell:	Das Werkzeug ist nach dem genannten Prüfverfahren und Prüfparametern für den MMS/MMKS-Einsatz uneingeschränkt zu empfehlen.

HPM MMS/MMKS GEPRÜFT

Hanspeter Münzing
Geschäftsführer HPM Technologie GmbH

Rudolf-Diesel-Straße 3 · 72525 Münsingen · Fon: 07381 9344-0 · Fax: 07381 9344-88 · www.hpmtechnologie.de

HORN circular milling cutter for slot machining.

CIRCULAR MILLING: SUPERIOR MACHINING WITH A BROAD APPLICATION

Circular milling offers users a whole host of process advantages: it is fast, reliable and achieves good surface results. During the process, the tool plunges into the material either at an angle or on a very flat plane, and is then driven on a helix path. This means that threads, for example, can be manufactured to a high level of quality that can be reproduced. When compared to machining using indexable inserts in large or solid carbide milling cutters with smaller diameters, circular milling is generally more economical. Circular milling cutters have a wide range of applications: they are able to machine steel, special steels, titanium and special alloys. These precision tools are especially suited to slot milling, circular interpolation milling, thread milling, T-slot milling and profile milling processes. However, they also perform well in special applications, such as milling sealing slots or machining connection rods.

Circular milling cutters also offer advantages relating to turn milling. When deep holes are being machined, long chips often occur if turning tools that are continuously cutting are being used. These chips repeatedly lead to interruptions in the machining process. In the case of turn milling, the nature of the process means that only very short chips are produced, and these can be rinsed out of the hole using cooling lubricant. As a result, unlike conventional turning methods, turn milling can run automatically – saving time and money. Profile milling also has advantages for the process. This allows different shapes to be manufactured at the requisite level of quality and with excellent process reliability. Not only that, but it requires just one holder system. In practice this means that time-consuming tool changes are no longer required, which makes this type of milling particularly economical.

Nowadays, industrial manufacturing uses materials that make the machining process even more demanding, such as steels with higher alloys, special steels in the medical technology sector or high-tech materials such as titanium for the aviation and aerospace industries. This increases the demands on cutting edges, especially when it comes to the cutting edge geometry, and on the substrate and coating. These parameters must be finely tuned to one another if the relevant tolerances are to be adhered to in workpiece geometries and surfaces. Precision tool manufacturers often require several test runs before being convinced of the results. Furthermore, users demand high cutting speeds, long service lives and resistant coatings, meaning more profitable tools as a result. This requires new cutting material, coating and geometry combinations.

Horn is leading the way in this area and is continually expanding its range of circular milling cutters to include larger, but also smaller, diameters. Today, it provides tools with diameters of up to 35.7 mm (1.4055") and larger slot depths in line with this, as well as tools with milling widths of up to 16 mm (0.6299"). This has been made possible by optimising the interfaces in exchangeable head milling cutter systems – the only way to enable higher loads at the interface. The HORN product portfolio includes, for example, exchangeable head supports with three and six cutting edges for diameters from 9.7 to 35.5 mm (0.3819" to 1.3976").

Nevertheless, there are machining tasks that still cannot be solved because the slot depth is too large for the given diameter, for instance. In such cases, DCX solid carbide milling cutters are an ideal choice. Horn developed these tools in partnership with medical technology manufacturers, and they expand the range of milling tools available for diameters from 20 to 40 mm (0.7874" to 1.5748"). The milling range from the DC solid carbide line is perfect for smaller diameters of up to 10 mm (0.3937"). Thread milling cutters from M 1.6 and up round off the DC range. In these cases, the cutting edge geometry and coating have been adapted to the actions taking place in the smallest of threads.

Profile milling of critical materials and machining at increasing throat depths is set to take on an even more important role in the future. Not only that, but more cutting microgeometry variations are likely to arise. Horn will also be developing its tool coatings so that they are better able to withstand high temperatures and minimise wear. Additionally, the trend towards smaller tools will continue in micro-machining across the board as it continues to grow in importance.

6-edged slot miller with internal cooling.

Mini system 108 – Slot depth of up to 1 mm (0.0394"), cutting edge ø of up to 9.6 mm (0.378").

Mini system 111 – Slot depth of up to 2.3 mm (0.0906"), cutting edge ø of up to 13.4 mm (0.5276").

Mini system 116 – Slot depth of up to 4.3 mm (0.1693"), cutting edge ø of up to 20.4 mm (0,8031").

System 306/606 – Hole ø from 10 mm (0.3937"), cutting edge ø of up to 9.6/11.7 mm (0.378"/0.4606").

System 308/608 – Hole ø from 13.7 mm (0.5394"), cutting edge ø of up to 13.4/15.7 mm (0.5276"/0.6181").

System 311/611 – Hole ø from 18 mm (0.7087"), cutting edge ø of up to 15/17.7 mm (0.5906"/0.6969").

System 313/613 – Hole ø from 22 mm (0.8661"), cutting edge ø of up to 21.7 mm (0.8543").

System 328/628 – Hole ø from 28 mm (1.1024"), cutting edge ø of up to 24.4/27.7 mm (0.9606"/1.0906").

System 332/632/636 – Hole ø from 32 mm (1.2598"), cutting edge ø of up to 31.7 mm (1.248").

System 335 – Hole ø from 35 mm (1.3780"), cutting edge ø of up to 34.7 mm (1.3661").

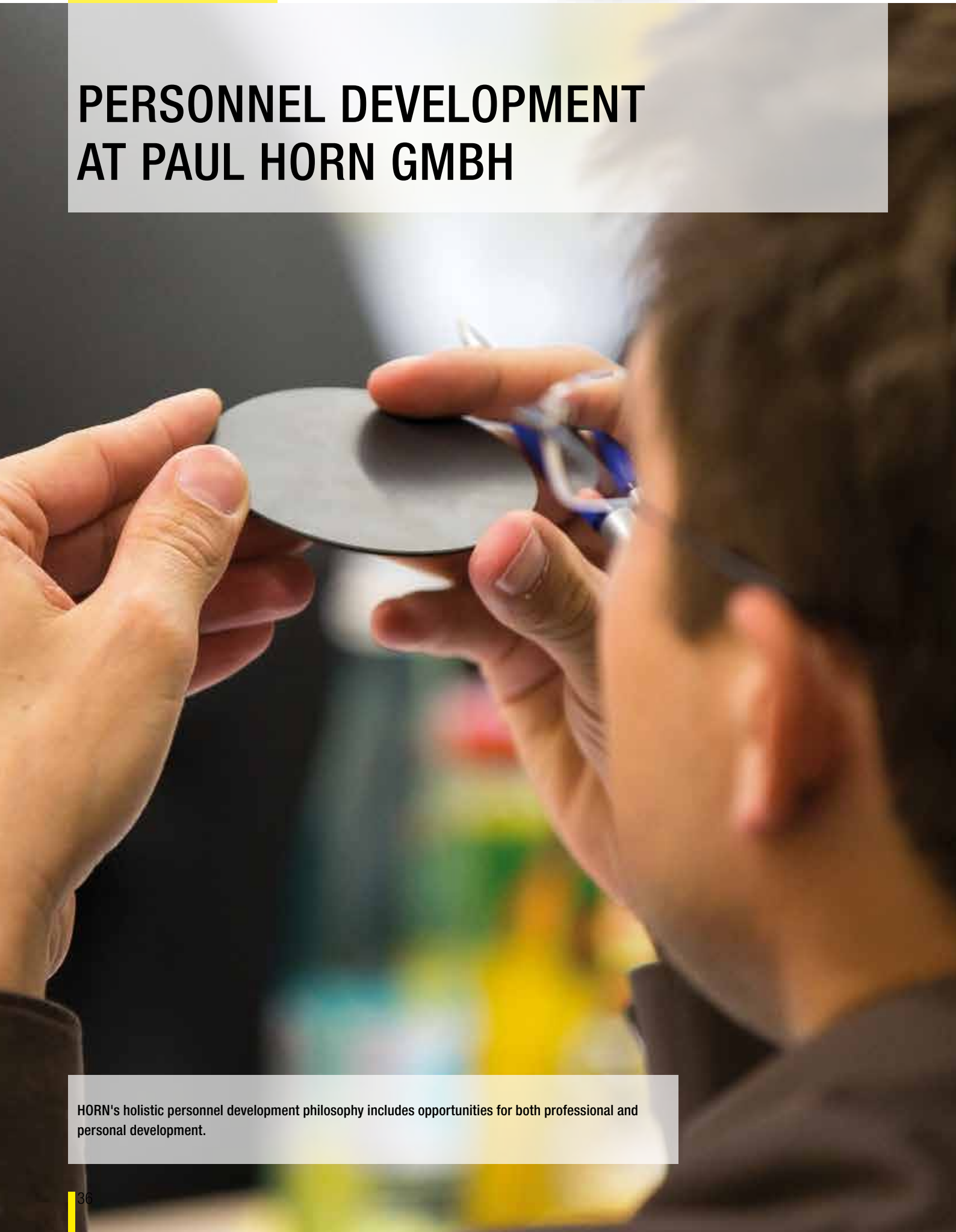
System 380/381 – Milling shanks, cutting heads and side milling cutters, hole ø from 45 mm (1.7717").

System 713 – Cutting inserts of type 713, number of teeth Z = 12, slot and face milling from a hole ø of 22 mm (0.8661").

System DC – Solid carbide milling cutters for slot milling with a cutting edge ø of 4.0 to 40.0 mm (0.1575"to 0.7874"). The tools, available in several carbide grades, are particularly good performers when it comes to machining barely machinable materials for medical technology, for example.

System M 275 – Milling shanks, cutting heads and side milling cutters, hole ø from 32 mm (1.2598").

PERSONNEL DEVELOPMENT AT PAUL HORN GMBH



HORN's holistic personnel development philosophy includes opportunities for both professional and personal development.

HORN Academy: Providing services in-house

“We can only achieve the very best for our customers if we make sure we have the very best conditions here at HORN too.” This quote from Lothar Horn, Managing Director of Paul Horn GmbH, shows the basis on which the HORN Academy has developed. The educational institute is comprised of five pillars: training, advanced training, degree programmes, retraining and technology seminars.

To achieve the very best for our customers, we need employees in all areas of the company who can produce the best possible results in their work. There are two ways in which personnel development at HORN helps them to do this: one is a needs assessment, and the other is an internal advanced training catalogue. The latter covers a wide range of courses and is subdivided into advanced professional training, personal development and communication skills, health and prevention, as well as sport and leisure. To offer these, personnel development draws on the resources of both the HORN Academy itself and external specialists. The internal advanced training catalogue also has a role to play in the needs assessment, as the results of the assessment are matched against the existing range of courses.

The goal: Creating experts

The HORN Academy's strengths are particularly highlighted when it comes to honing its employees' technical expertise, and it benefits from the contact that it has with both customers and employees. The IHK (German chamber of commerce) course for becoming an industry specialist in cutting tool technology is one such example: the personnel development strategy aims to use this advanced training course to establish a consistent level of knowledge expected for all employees in the grinding shop and other areas. Participants receive the most up-to-date theoretical and practical knowledge in 240 teaching units. In turn, this accelerates processes in day-to-day work as well as minimising queries and errors.

Positive development

The personnel development strategy defines learning outcomes for all the advanced training courses, and these can be used to measure whether objectives are being met. Feedback from practical experience is particularly important in this process, as this is the only way of shining a truly meaningful light on the success of the training course. Manuela Horn-Stemmler, who is in charge of company management and personnel development, and is a member of the Management Board, also has positive comments to make: “The responses from personal meetings and feedback surveys are confirming that we're on the right path, and personnel development department and the HORN Academy are an integral part of this. By staying by our employees' side as they advance on their career path, we ensure that we can succeed together.”

In her role as a personnel and business coach, Manuela Horn-Stemmler gets hands-on in the advanced training course.

Pedal car 3.0.
In 2014, the HORN apprentices are banking on CFRP.

INSPIRING ENTHUSIASM WITH HIGH-TECH SOLUTIONS

Apprentices build pedal car out of fibre composite materials

2012 saw the start of the first pedal car project for HORN apprentices. The aim: was to participate in the Great British Pedal Car Grand Prix in the English town of Ringwood. The race follows a circuit of approximately one kilometre through the town centre, and each team is allowed four drivers, one pusher and one mechanic. The winning team is the one who completes the most laps in two hours. A popular local event too, it draws in around 15,000 spectators. So far, the HORN subsidiary HORN Cutting Tools Ltd. has already participated in the race twice with its own pedal car. HORN restricts the project to second-year apprentices because they have enough basic knowledge of the subject, but no final exams looming around the corner. Before the 2012 team could even start the race, however, they had a long road ahead, starting with some key questions. What is a pedal car? What requirements does it have? And how is it built? A pedal car is sort of a modern soapbox cart, driven using pedals in a similar fashion to a recumbent bike. The apprentices were expected to supervise the project from end to end: this included the planning, design, budgeting, production, assembly and communication stages, as well as the race itself. Out of 70 participants, the HORN trainees managed to come in 20th place, and the project won HORN the 2013 intec award recognising young talent at the Leipzig trade fair.

A more experienced team the second time round

2013 saw the HORN apprentices take to the starting line with a new pedal car once again. This year's team had the added benefit of experience from the year before. Drawing on this, the team made adaptations that included lowering the centre of gravity and dispensing with suspension. In addition, they used hydraulic disc brakes with brake boosters. The team also made adjustments to the dimensions – the car stayed almost identical in length, but became narrower. Furthermore, the conventional gear shifting system made way for a 14-speed gear hub. The car managed top speeds of around 50 km/h in test runs over a long straight. Each year, the race venue alternates between Ringwood and New Milton, and this year it was New Milton's turn to play host to a good 50 teams. The apprentices managed to improve on the previous year's result and crossed the finish line in sixteenth place.

The HORN team 2013 presents its pedal car 2.0.

Using new materials

In 2014, fibre composite materials have continued to take centre stage. In the hybrid and e-mobility sectors in particular, car manufacturers are putting efforts into reducing vehicle weight and increasing rigidity. The HORN apprentices embraced this trend, building a CFRP chassis for the third-generation pedal car. Even the rear axle is made of CFRP and features a locking differential. The apprentices have made sure that the fixtures cut down on weight too. In this case, they have incorporated generous recesses and stable connector struts to ensure the car performs at its best. The greatest challenge in this project is getting everything up to one hundred percent before production, as changes and adjustments can no longer be made after this point. This even includes the openings for the chain and the holes for various fixtures, such as the wheel mounts or the crank fixture, which continue to be made of metal and are screwed on to the chassis. The steering wheel moves from its holding position at waist height to the left and right next to the seat.
As the production aspects of the project are related to the machining sector, it is also the perfect arena for integrating the company's own products. CVD-D tools are mainly used when machining CFRP: these cut the abrasive material and do not break it like PCD tools. In addition to the high-feed milling cutter, aluminium milling cutters and HORN grooving tools – which seem to have been made for this project – have also been used with the aluminium components. The project allows the apprentices to learn about materials, selecting tools as well as putting them into practice.

Staying power

Unlike the previous races, which each lasted two hours, this year the apprentices' high-tech pedal car will be entered into a 24-hour race in Bristol. The number of drivers taking part in this race has also increased from four to six people. The race will begin on 11th October at 3 p.m. local time and run until 3 p.m. on the following day, 12th October. Despite the use of futuristic materials, the results are ultimately still down to the team's performance – but regardless of what place they finish in, there is no doubt that this project will still provide both a fantastic experience and a lot of fun.

High-performance components are used alongside CFRP.

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Subsidiaries or representatives

Hartmetall-Werkzeugfabrik
Paul Horn GmbH
Postfach 17 20
72007 Tübingen
Tel.: +49 7071 7004-0
Fax: +49 7071 72893
E-Mail: info@phorn.de
www.phorn.de

HORN S.A.S.
665, Av. Blaise Pascal
Bat Anagonda III
F-77127 Lieusaint
Tel.: +33 1 64885958
Fax: +33 1 64886049
E-Mail: infos@horn.fr
www.horn.fr

FEBAMETAL S.p.a.
Via Grandi, 15
I-10095 Grugliasco
Tel.: +39 011 7701412
Fax: +39 011 7701524
E-Mail: febametal@febametal.com
www.febametal.com

HORN CUTTING TOOLS LTD.
32 New Street
Ringwood, Hampshire
GB-BH24 3AD, England
Tel.: +44 1425 481800
Fax: +44 1425 481890
E-Mail: info@phorn.co.uk
www.phorn.co.uk

SK Technik spol. s.r.o.
Jarni 1052/44k
CZ-614 00 Brno
Tel.: +420 545 429 512
Fax: +420 545 211 275
E-Mail: info@sktechnik.cz
www.sktechnik.cz

HORN USA, Inc.
Suite 205
320, Premier Court
USA-Franklin, TN 37067
Tel.: +1 615 771-4100
Fax: +1 615 771-4101
E-Mail: sales@hornusa.com
www.hornusa.com

HORN Trading Co. Ltd
Room 905, No. 518 Anyuan Rd.
CN-200060 Shanghai
Tel.: +86-21-52833505
Fax: +86-21-52832562
E-Mail: info@phorn.cn
www.phorn.com/chn

HORN Magyarország Kft.
Gesztenyefa u. 4
HU-9027 Györ
Tel.: +36 96 550531
Fax: +36 96 550532
E-Mail: technik@phorn.hu
www.phorn.hu