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Starrag
Magazine
01–2026

star

More performance in less space: A manufacturing system sets new standards in flexibility and efficiency

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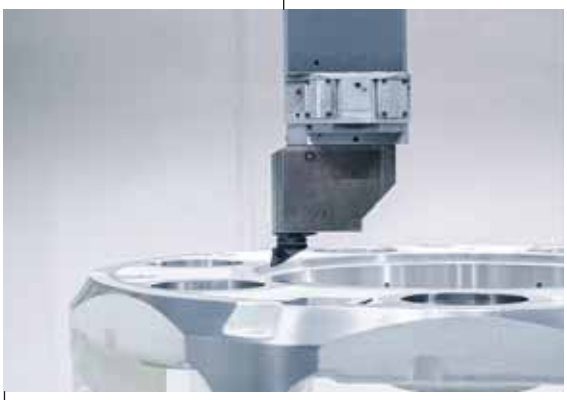

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Star – The Starrag Division Magazine

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Picture credits:
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© Tornos AG: p. 44–47

Design: Gastdesign.de

Printing: Druckhaus Süd, Cologne

Star – Starrag's magazine – is published twice a year in German, English, Chinese and French. Despite careful editing, no guarantee can be made.

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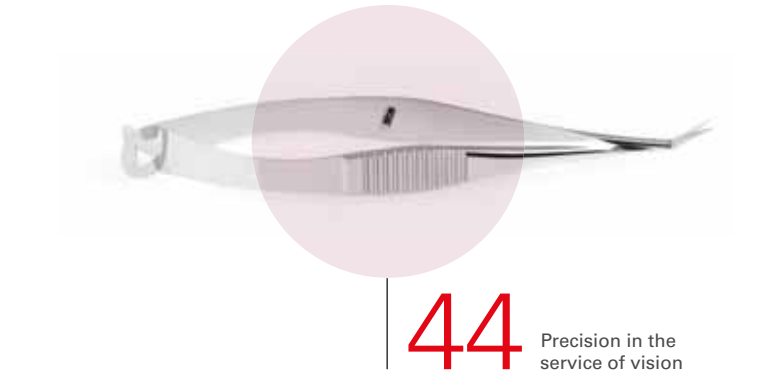

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Martin Buyle
CEO, Starrag Division

Dear Reader,

This February in Italy had an Olympic feel to it – in Milan and Cortina d'Ampezzo. Athletes from all over the world gathered there for a friendly competition.

In mechanical engineering, too, there are fields where top performance is required. Right at the start of this issue, we report on a performance that could set a world record: Using the new Starrag S1250 HD, our milling specialists achieved impressive performance figures during the rough machining of titanium. The fact that this concept also performs well under industrial conditions is demonstrated by its use at Airbus: Following extensive endurance testing of the prototype machine, the aircraft manufacturer ordered five machining centers of this type for its Varel facility.

Top performance is in demand not only in aviation, but also in energy technology. At the Aerospace & Turbine Competence Center (ATCC) in Rorschacherberg, Starrag develops and tests new machining processes – such as those for housing components of mobile gas turbines on behalf of Siemens Energy.

But just as in elite sports, speed alone does not determine success. Precision is just as important. This is demonstrated, for example, by the Ecospeed F at Notthoff Engineering, a North American manufacturer of high-precision structural and functional components for the aerospace industry. There, complex aluminum structural components are manufactured to the highest standards of precision and process stability.

Precision is also a key focus when using a Dörries vertical lathe at Wilson Precision Equipment in China. The company manufactures large and complex structural components for wind turbines, compressors, and industrial plants, among other applications. With Starrag technology, Wilson is further expanding its production in heavy-duty cutting and significantly increasing processing efficiency.

The same applies to agricultural machinery: At PÖTTINGER, four Heckert H75 machines in a flexibly integrated production system ensure the precise machining of load-bearing components for mowers and tillage machines. And in gearing technology, too, every micrometer counts: At KAPP NILES, a Heckert HEC 800 is used to produce high-precision components for gear grinding machines, which in turn enable the production of gear and drive components with the highest levels of profile and concentricity accuracy.

In another industry, a lack of precision could literally be a sight for sore eyes. In the medical technology sector, Strub Medical GmbH & Co. KG manufactures high-precision microsurgical instruments. Tornos sliding headstock machines, such as the SwissNano 7, are used to manufacture components for eye surgery – applications where precision literally determines the success of the procedure.

Smithstown Light Engineering in Shannon, Ireland, also operates in a sensitive field with its orthopedic instruments and implant systems. The challenges here include frequently changing products and a high proportion of NPI (New Product Introduction), which requires new components to be transitioned into series production quickly and consistently. The Bumotec 191^{neo} forms the cornerstone of the NPI strategy.

But Olympic records – in sports as well as in mechanical engineering – are ultimately achieved by people. Remo Heusi has been heading the Starrag Group's Global Customer Service Department since September 2025. For him, service is much more than just a repair call when something goes wrong: He sees it as an expression of technical responsibility toward the machine, the process, and the user.

For us at Starrag, excellence means not only cutting-edge technology, but above all dedicated people and long-term partnerships with our customers.

I hope you enjoy reading this issue and gain some fascinating insights into the wide range of applications of modern precision manufacturing.

Martin Buyle
CEO, Starrag Division

Starrag wrapped up the trade show season with a strong appearance at EMO 2025 in Hanover.

From the leading trade fair to the start of the season: **Starrag makes its presence felt in Hanover and Bilbao**

Starrag wrapped up the trade show season with a strong appearance at EMO 2025 in Hanover. As the industry's leading trade fair, EMO remains the central meeting place for international manufacturing technology. In 2025, it continued to attract visitors from all over the world.

The impressive two-story Starrag stand effectively showcased the Group's wide range of offerings. Highlights included the Heckert X70 machining center, a complete nose landing gear from an Airbus A350, and machining operations on a Bumotec 191^{neo}.

Another particularly exciting aspect was the combination of real machinery and a digital experience: Using VR glasses and 360° applications, visitors could immerse themselves in the world of Starrag technologies and experience machines, motion sequences, and machining processes from entirely new perspectives.

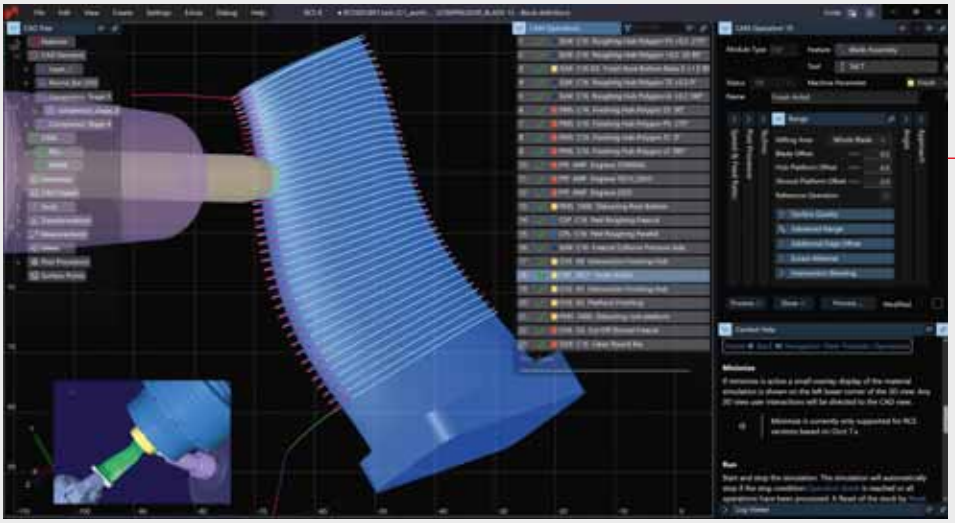
It will be a while before the EMO returns to Hanover. The next event in Hanover won't take place until 2029.

The BIEMH in Bilbao kicked off the 2026 trade show season. Starrag showcased its offerings there under the motto "From small to gigantically large", demonstrating the full breadth of its portfolio, from small precision solutions to gigantically large machine concepts. At the same time, the company sent an important signal to the Spanish market: MCAP Innovation Beyond Machinery was introduced as the new general representative for Spain. Thus, BIEMH not only marked a successful start to the season but also signaled the continued expansion of its international market presence.

The BIEMH in Bilbao kicked off the 2026 trade show season.

125 years of Heckert – from Wanderer to high-precision 5-axis machining

Heckert's roots date back to 1885, when Johann Baptist Winklhofer and Richard Adolf Jaenicke founded the Chemnitzer Velociped-Depot in Chemnitz. The bicycle repair shop quickly evolved into an industrial manufacturer under the name "Wanderer", and from 1899 onward, it also began producing milling machines. Over the decades, this developed into a broadly positioned industrial company with international significance. Alongside the production of vehicles and office equipment, machine tool manufacturing in particular grew into a key pillar of the business. Following the destruction of the plant in 1944 and its subsequent reconstruction, the company was renamed VEB Fritz Heckert in 1951. During this period, a clear focus on machine tools emerged. Heckert played a decisive role in shaping industrial manufacturing, particularly through the introduction of numerically controlled machines and a consistent focus on high-productivity series machining. Since 1998, Heckert has been part of Starrag. Today, the name stands for highly productive horizontal machining centers that combine precision, dynamics and process integration. With 5-axis technology, automation solutions and deep manufacturing expertise, Heckert enables applications that would have been considered unfeasible just a few years ago.



With RCS 8.0, Starrag introduces a new generation of turbine blade machining.

RCS 8.0 – where experience meets AI

30 years of CAM expertise meets machine intelligence: With RCS 8.0, Starrag introduces a new generation of turbine blade machining. This innovative software combines proven strategies with AI-assisted optimization – for maximum precision when working with complex free-form contours. Automated workflows, intelligent geometric adaptation to variable unmachined parts, and direct real-time feedback make the machining process faster, safer, and more efficient. At the same time, familiar features remain: Thanks to comprehensive backward compatibility, existing programs and strategies can be seamlessly integrated.The result: reduced machining times, extended tool life, and a new level of process reliability on 5-axis machining centers.

Precision, process-oriented thinking, and a passion for engineering …

… have shaped the entire career of Remo Heusi, who has been leading global customer service at the Starrag Group as Managing Director since September 2025. Anyone who talks to him quickly realizes that, for him, service is not a mere afterthought – it determines the success of an investment. Those who regularly maintain their high-tech machinery and prioritize preventive maintenance not only ensure maximum availability but also achieve the best total cost of ownership in the long run.

"Service isn't a department; it's an attitude." This quote comes from Günther Eller, his long-time predecessor, who was an advocate of strong customer focus. "His focus has always been on providing our customers with the highest possible machine availability throughout the entire lifecycle," says Remo Heusi. "I will, of course, continue to follow this approach."

Customer service in mechanical engineering

The Swiss engineer focuses on the ongoing development of global customer service with the aim of ensuring the productivity and cost-effectiveness of the Starrag machines used. The focus here is not on new concepts, but rather on clearly defined services and a transparent structure for the service offerings.

"In addition, I would like to work with our strong team to standardize our existing service offerings more effectively and harmonize them across all products. This is how we create greater transparency, increase brand recognition, and make it easier for our customers to access our services," Remo Heusi explains.

The service should be designed in a consistent manner and be easy for users to handle. This understanding of service is rooted in his many years of experience: Prior to taking on this role, Remo Heusi held senior service and management positions at two long-established Swiss companies – the Bühler Group and Netstal – which, like Starrag, are among the global leaders in their respective industries. At both companies, service was closely linked to productivity, process stability, and long-term machine availability.

The experience he gained there in operating highly automated, high-performance machines continues to shape his understanding of service as an integral part of mechanical engineering – not as subsequent support, but as a technically relevant function throughout the entire lifecycle.

Machine availability as a key performance indicator

For Remo Heusi, machine availability is a key economic indicator. The true value of a machine becomes apparent through daily use over many years.

"It is therefore crucial to maintain machine availability at a consistently high level throughout the entire lifecycle. That requires consistent and regular maintenance," he emphasizes. For him, unplanned downtime is a cost driver that can be avoided as much as possible through predictable, preventive measures. His leadership roles at Bühler and Netstal have also shaped his professional ethos: For Remo Heusi, service isn't just about making repairs when something breaks down, but rather an expression of technical responsibility toward the machine, the process, and the user.

Access to machine data

A key objective is to align services more closely with existing technical expertise. The focus here is on leveraging insights gained from applications and processes to make informed assessments of machine conditions and determine appropriate actions. "I see particularly great potential in areas where we can leverage our in-depth application expertise to provide even more comprehensive support to customers and create measurable added value," explains Remo Heusi.

"The highest costs are usually caused by unplanned downtime – and that is exactly what we aim to prevent through close customer proximity and proactive service offerings." Remo Heusi, Managing Director of Customer Service at the Starrag Group

"It is crucial to maintain machine availability at a consistently high level throughout the entire lifecycle."

In the future, such services could also be aligned more closely with clearly defined technical metrics such as availability or system performance – an approach that is likely to gain in importance. Proactive solutions with a forward-looking and preventive nature, for instance automated remote fingerprinting, play an important role in this regard. This allows Starrag machines to be monitored remotely, enabling even the slightest deviations in performance to be detected and analyzed at an early stage. Maintenance tasks can be planned in a targeted manner, thereby increasing the machine's availability and productivity. Customer service thus remains the permanent technical interface between the machine and the user – taking a preventive, data-driven approach and clearly focused on ensuring high machine availability.

Hydrostatically guided Starrag machining center achieves unprecedented cutting parameters in titanium

New world record!

At EMO 2023, Starrag presented the prototype of the hydrostatically guided Starrag S1250 HD 5-axis machining center. With its exceptional rigidity and damping, the machine already achieved cutting parameter records in titanium roughing at that time. The current standard version increases these records to an unbelievable level, as proven in initial tests. An even more rigid structure, a new milling head with 15,000 Nm, and a gear rotary table with 25,000 Nm torque, are responsible for the enhancements.

For many years now the Starrag STC series has been setting standards in the efficient machining of structural components made of titanium. This extremely tough material with its poor thermal conduction coefficient which is difficult to cut subjects tool cutting edges to high stress and prevents high speeds. Successful machining requires low speeds and high torques, which in turn demand high rigidity and damping of the machine. This is why Starrag decided to offer its horizontal STC 1250 machining center in a variant in which the horizontal linear axes are guided hydrostatically.

Friction-free, wear-free, extremely rigid, and highly damped – with these properties the new machining center under the new name Starrag S1250 HD is appropriate for the five-axis heavy-duty cutting of titanium structural components. In roughing tests the prototype already achieved up to three times the material removal rate of the version with roller bearings. The improved damping and dynamic performance also ensured excellent precision and surface quality during finishing. The fact that this new concept is a hit is confirmed by the order from Airbus for the Varel site. After some endurance tests with the prototype machine, the company placed an order for five Starrag S1250 HD machines – with a few special requests.

High-torque rotary table and improved output in the head

"Our customers were impressed by the tests conducted two years ago", reports Alexander Fitz, Sales Director for Aerospace & Turbine at Starrag AG. "Because the Starrag S1250 HD promised considerably more efficient cutting of titanium structural components than ever before. In order to optimally fulfill the special

In roughing tests the prototype already achieved up to three times the material removal rate of the version with roller bearings.

For many years now the Starrag STC series has been setting standards in the efficient machining of structural components made of titanium.

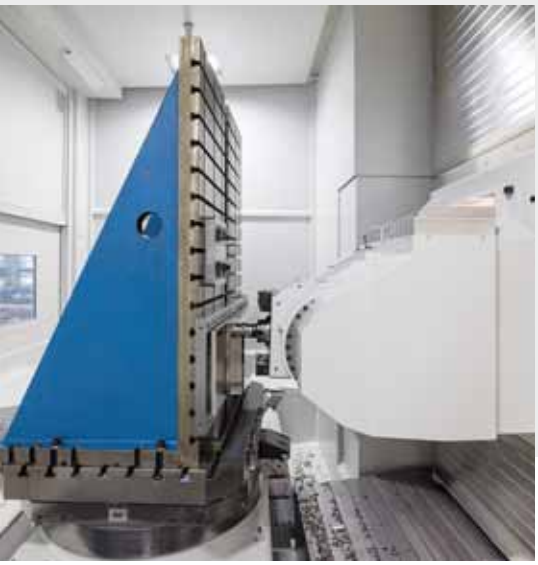
requirements of titanium cutting specialists, we decided to make some modifications to the series machine." The modifications mainly involved the rotary table and the milling head, both of which were adopted from the standard STC 1250 for the prototype of the HD variant. Alexander Fitz explains: "We do not need a fast-moving, direct-driven table for the high-performance milling of titanium structural components. This is why we changed it for a gearbox variant, which can better meet the requirements with its enormous torque of 25,000 Nm and 32,000 Nm clamping torque." Other than a torque increase in the table, the customer also wanted changes to be made to the milling head. "Our swivel milling head used in the standard STC machines is very compact and allows optimal accessibility to the workpiece and thus the use of short tools", says Alexander Fitz. "We modified this slightly for the Starrag S1250 HD. By enlarging the swivel milling head on one side we created space for a 50% stronger A-axis with 12,000 Nm torque and 20,000 Nm clamping torque – while retaining the previous good accessibility."

Starrag's own robust 53 kW gear spindle is used as a work spindle, which provides 1,600 Nm torque and a speed of 4,500 rpm. A new feature here is the HSK-B160 interface. "The large contact surface with 160 mm diameter ensures high tool rigidity", argues Alexander Fitz, "which is important for large cutting depths – especially for tools with a wide overhang."

More rigidity in the machine

The Starrag developers made a few modifications to the series produced machine compared to the prototype, not only with regard to the points suggested by the customer. "Our aim was first and foremost to further increase the possible removal rates and reduce tool wear", mentions Rolando Senn, leading designer in hydrostatics. The most important factors in this context are the rigidity and damping of the machine. "Therefore, we made the structure of the machine, both the beds and the stands, even more rigid",

One of the biggest cost factors in titanium machining is the tools, which are subject to heavy wear.



reports Rolando Senn. "We also managed to increase the contact surface of the hydrostatics, thereby increasing rigidity and damping. We were also able to make the automatic control system of the hydrostatic guides more robust and maintenance-friendly through a mechanical solution."

The previous tests also underlined that at the moment it is not the machine but the tool that is the limiting factor.

The true values are reflected in practice

The initial tests of the series produced machine showed very promising results. Dr. Markus Ess, Director of Technology of the Starrag Business Unit HPS, highlights one test that was conducted in Rorschacherberg in the presence of the titanium specialists from Airbus, Varel: "We made a so-called performance cut, which is performed with ideal clamping and tool ratios. Roughing with short 80 mm Igel milling cutter, 68 mm depth in the full cut; with 80 mm/min feed and 160 turns. Then the tool capacity was exhausted. The machine ran very smoothly – the power consumption at the spindle was only at roughly 60 to 70%."

Further performance cuts in titanium (Ti6Al4V) on the new Starrag S1250 HD yielded results, which, according to the Starrag milling specialists, indicated a world record in titanium machining: With the carbide cutter with Ø40 and 18 teeth, developed by Starrag and designed for heavy-duty machining, a titanium block was roughed with the following cutting parameters: cutting speed vc = 120 m/min, tooth feed fz = 0.45 mm, cutting depth axial ap = 98 mm, and cutting depth radial ae = 2 mm. The speed was 955 rpm, the feed speed vf was 7,735 mm/min, and the average undeformed chip thickness hm was 0.101 mm. The result: An unbelievable metal removal rate Q of 1,516 cm^3/min, which promises enormous productivity and demonstrates the advantages coordinated systems with machining centers, tools, and technology bring to the customer. The previous tests also underlined that at the moment it is not the machine but the tool that is the limiting factor. Therefore, further joint tests are planned – with our own tools, but also with tools from leading tool manufacturers – in order to achieve more world records for the Starrag S1250 HD.

Long tools for deep cavities

The developers of the Starrag S1250 HD are already keeping an eye on future demands. That's because modern processes for producing near-net shaped blanks are likely to reduce the amount of roughing that is performed in coming years. The focus then shifts to the challenge of entering the complicated and deep cavities with tools up to 500 mm long and producing a high level of performance there. But it also essentially comes down to the tool, whereby the large planar support of the HSK-B160 retainer offers the best support.

Initial tests show that vibration-damped versions are far superior to monolithic tools. "The structure of our HD machine is also ideally suited for this type of machining", says Markus Ess confidently. "We have built an extremely rigid, good titanium machine, with which we can perform excellent roughing tasks and also work in complicated cavities with very long tools – a future-proof mix."

Significantly reduced tool wear

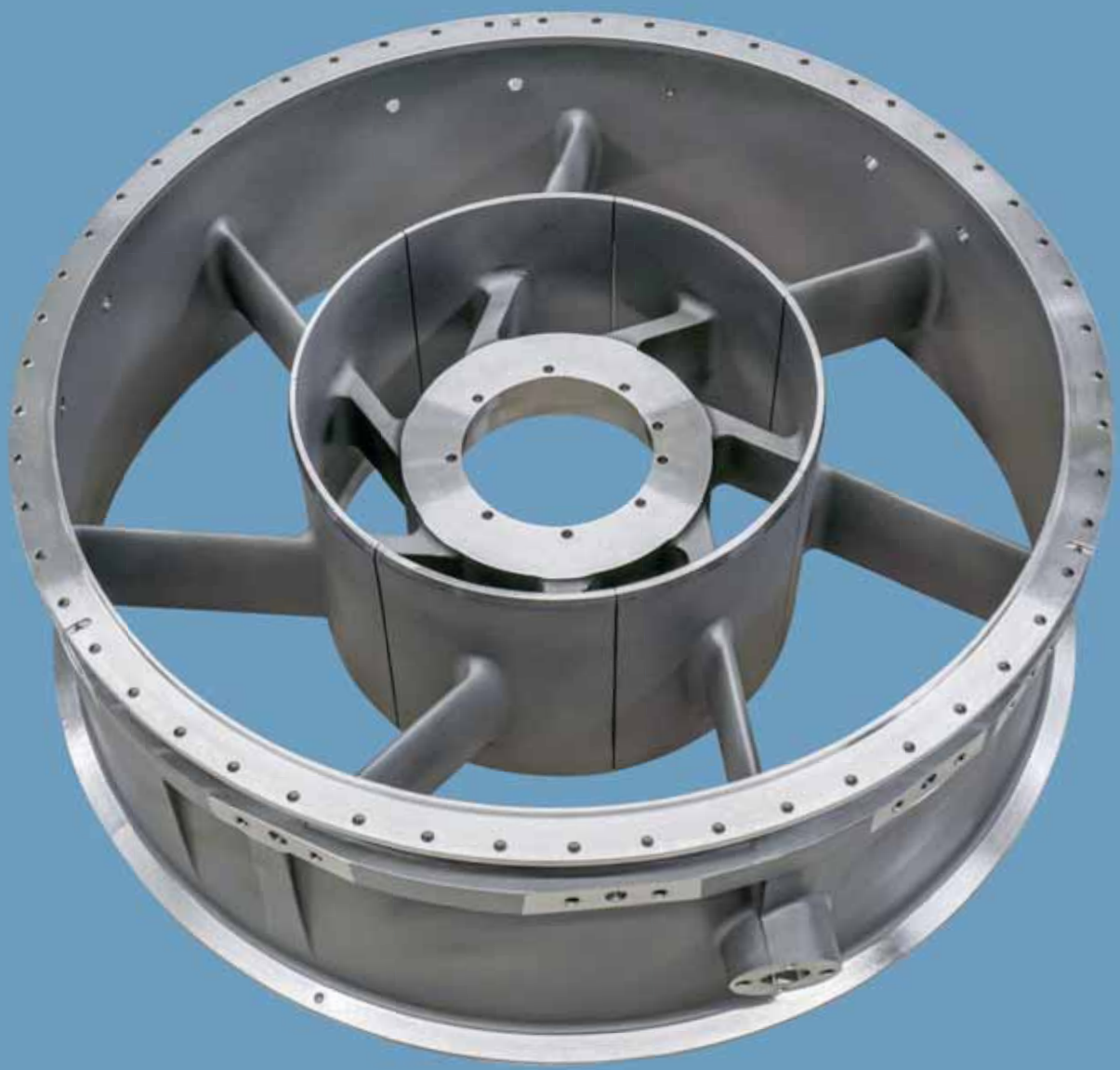
One of the biggest cost factors in titanium machining is the tools, which are subject to heavy wear. The good damping ensures enormous improvements in this context, i.e. considerably longer life, even when the speeds are increased. According to Rolando Senn, this represents huge savings potential: "During intensive machine use the savings put the additional costs of the hydrostatics into perspective."

Markus Ess also mentions another benefit companies get with the Starrag S1250 HD: "Even though the power consumption of the machine is higher compared to other machines, the user saves lots of energy when measured by the output with the significantly reduced machining time and reduces their CO_2 footprint. With regard to the component, the user requires less drive power overall and also saves base load, which comprises power consumption of cooling lubricant system, hydraulics, pneumatics, cooling, etc.

"During intensive machine use the savings put the additional costs of the hydrostatics into perspective."

Rolando Senn
Senior Hydraulics Design Engineer

Starrag's own robust 53 kW gear spindle is used as a work spindle, which provides 1,600 Nm torque and a speed of 4,500 rpm.



Starrag will manufacture the housing components for gas turbines and ship them to the USA as shipsets.

Process expertise in turbine manufacturing

At the Aerospace & Turbine Competence Center (ATCC) in Rorschacherberg, Starrag develops, tests, and optimizes complex machining processes. Recently, the facility has begun manufacturing casings for mobile gas turbines – a contract from Siemens Energy Indianapolis, USA. For Starrag, this is essentially an R&D project.

For many decades, Starrag has been accumulating process expertise in turbine manufacturing at its headquarters in Rorschacherberg. Knowledge that the aviation and energy industries around the world are putting to good use. After all, Swiss mechanical engineers are primarily suppliers of manufacturing solutions. Klaus Struebel, Starrag's Sales Director for Asia Pacific and a turbine expert, explains: "Most customers don't just want our premium machines. They purchase them as part of functional, efficient processes – often integrated into complete manufacturing systems. This requires up-to-date process expertise at all times."

Starrag secures this business through contracts for testing and small-batch production, among other things, which customers use, for example, to manage production peaks. A current order being manufactured at the ATCC is from Siemens Energy Indianapolis. Starrag is responsible for the complete machining of housings for the SGT-A05 and KB7X gas turbines, which are produced in only small quantities, for the American company.

Learning by doing

According to Dr. Markus Ess, Director of Technology of the Starrag Business Unit HPS, this order has a special background: "We're not actually a parts supplier, even though we already have experience in casing manufacturing. However, since the scope of the Siemens contract covers the entire process chain – from unmachined parts to housing components ready for assembly – we saw this as an opportunity to expand and improve our process expertise. After all, our customers are increasingly seeking this extensive expertise."

Siemens Energy also recognizes that Starrag is not a traditional supplier. The request was made out of necessity. This is because small-batch production was no longer economically viable for the previous supplier, and no other service provider with the necessary expertise and machinery could be found. Starrag, on the other hand, can use its ATCC facility in Rorschacherberg for the majority of the work, as it offers the ideal conditions for machining housings. Spanning approximately 2,000 m^2, it is equipped with the latest four- and five-axis Starrag machining centers. In addition, experienced application specialists and developers are on site. "From an economic perspective, it's an advantage that we don't have to invest in new machines for the Siemens contract," says Markus Ess. "For the Siemens casings, we use the STC 1250MT and STC 800MT machines available at the ATCC, which are suitable for cutting and turning, depending on the casing size and requirements."

Casing manufacturing for Siemens – what needs to be done?

Gas turbines typically consist of several stages: the air inlet (with a booster, if necessary), the compressor (usually a multi-stage unit), the combustion chamber, the turbine itself – which converts the thermal energy of the hot gases into mechanical or electrical energy – and the exhaust. This is also the case with the Siemens SGT-A05, which requires six different casing components for its housing. The newer KB7X generation includes an additional casing.

Each of the rotationally symmetric casings must meet different requirements and varies in size and geometry. The materials also vary depending on the prevailing temperatures. Titanium is used in the cold section, while Inconel is used in the hot section (up to 2,000° C).

Under the contract, Starrag will manufacture the housing components for gas turbines and ship them to the United States as shipsets. A "shipset" refers to a complete set of casings for a turbine.

A mix of very small quantities and great diversity

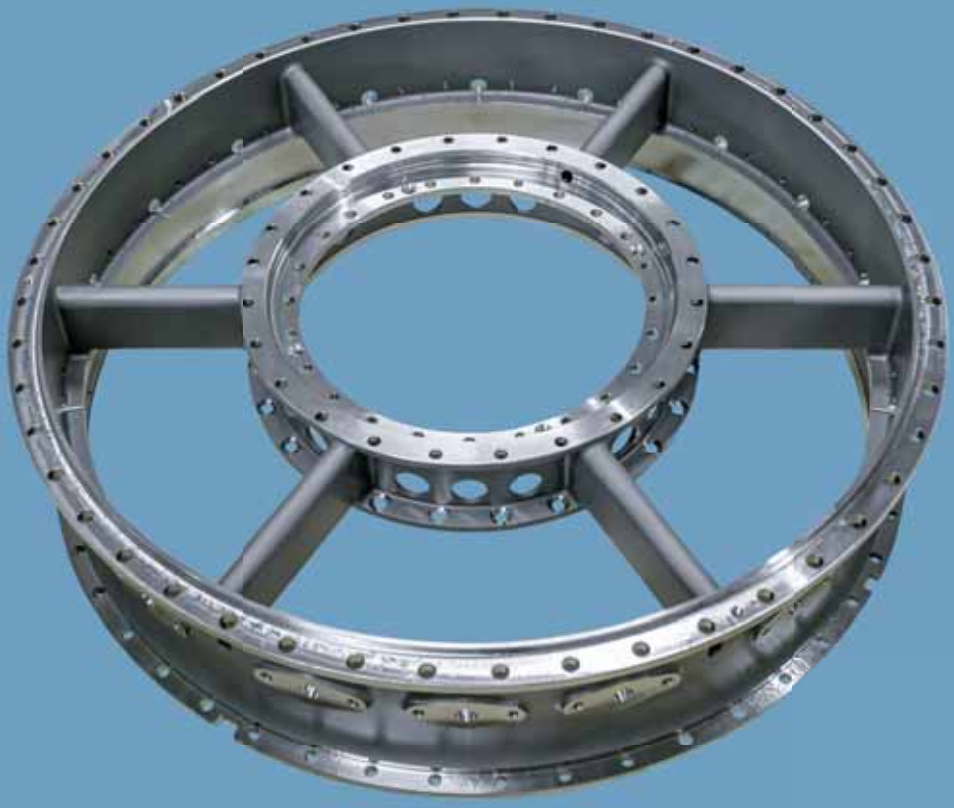
Ten shipsets are to be delivered in 2025. "We have agreed with Siemens on two deliveries, each consisting of five shipsets," reports Klaus Struebel. "For us, this means that we manufacture each of the seven different casings in batch size 5, thereby keeping setup and heat treatment costs to a minimum." Nevertheless, sophisticated production planning is required that takes into account not only machine utilization but also the supporting processes. "In this case, we are not only responsible for turning, cutting, and drilling operations, but also for additional EDM and welding work, heat treatments, and measurement and testing processes," explains Markus Ess, Head of Technology. "It is precisely this knowledge of process chains that we generate here that is so valuable to us."

Short preparation time

Only six months were available for technology development. Not exactly abundant, given the wide variety of casings, each with very different requirements. This starts with materials that are difficult to machine and extends to limited access to certain features, such as holes. In order to position attachments such as blades with precision, tight tolerances must be observed. In addition, there are surfaces that require a high degree of surface finish. In addition to the machining processes performed on the Starrag machines, supplementary work must be carried out. Pressure tests are therefore required for deep-hole drilling. Welding and EDM tasks, heat treatment and hardening processes, as well as Cerakote coating, are outsourced to certified external partners. The same applies to the required Fluorescent Penetrant Inspection (FPI) process.

Markus Ess points out that "many of these operations are intermediate processes that take place outside our direct control and interrupt the in-house process. However, our experienced staff succeeded in implementing a well-functioning process chain and completing the order to our client's satisfaction." Klaus Struebel adds: "Since our client is based in the United States, we developed a comprehensive project management system that includes weekly online meetings to discuss and monitor progress. Because Siemens wanted to know exactly how the work was progressing and whether we were on schedule."

Each of the rotationally symmetric casings must meet different requirements and varies in size and geometry.



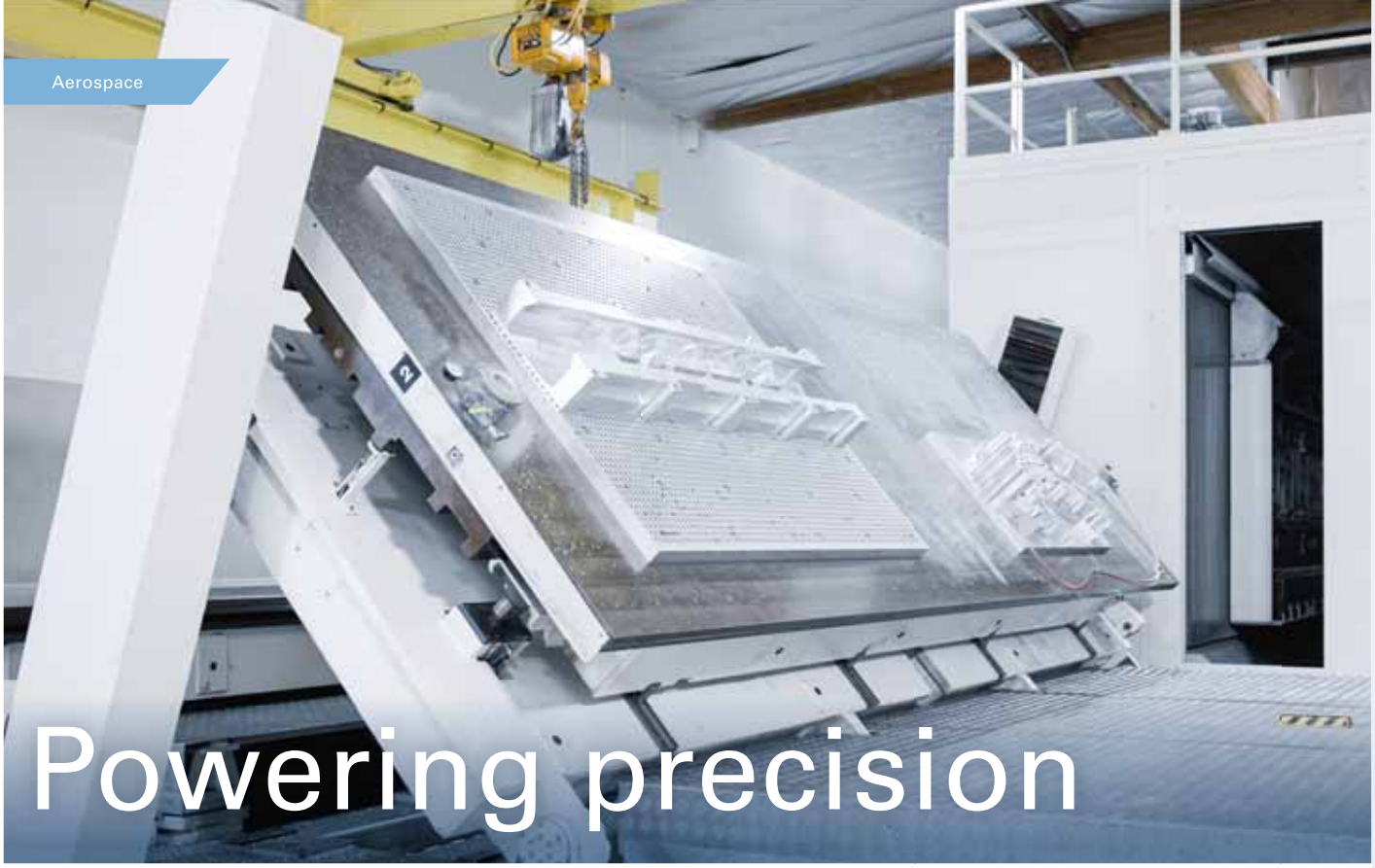
Carbide milling cutters developed and ground in-house contribute to optimized machining performance.

Critical one-time costs

Technological development was also subject to economic constraints. After all, Starrag didn't just want to gain expertise. Thus, one-time costs were a major factor, and the clamping device was one of them. Stanislav Stankevich, Senior Application Engineer, explains: "We had originally planned to use four different devices, but that would have made the project uneconomical. That's why we came up with an innovative, modular clamping concept – a combination fixture that allows us to clamp all seven housing types using a single device." For this purpose, a matrix is marked on the pallet that specifies the clamping positions for each casing. In this process, the same grooves are always used, but different standard vertical clamping elements are employed. This allows an experienced operator to reconfigure the device relatively quickly.

Further in-house developments were necessary to ensure an efficient machining process. Stanislav Stankevich, who has extensive expertise in the field of casings, was responsible for running in the process and the tools, as well as optimizing the equipment. He explains: "To enable drilling and cutting even in hard-to-reach areas, our experts developed extra-slim angle heads that feature a special interface providing exceptional rigidity and are capable of handling heavy-duty cutting." Carbide milling cutters developed and ground in-house contribute to optimized machining performance, and other tools such as deep-hole drills and reverse countersinks also originate from Starrag's own R&D department.

At the end of the manufacturing process, each part is marked with a serial number in accordance with regulations. Bolts, pins, T-nuts, and supplied components are installed. The shipset is then placed in the reusable packaging in which the blanks were originally delivered. The casing set is then shipped to Siemens in the United States, where the turbine is fully assembled and tested.



Powering precision

The long-term partnership behind Notthoff's success

From its beginnings as a World War II job shop to its evolution into a specialist in high-speed structural aerospace machining, Notthoff Engineering has consistently recognized that the right equipment is key to turning potential into performance. Guided by this forward-thinking mindset, the California-based manufacturer invested in its first Starrag Ecospeed F 2060 horizontal machining center in 2013. More than a decade later, building on that successful experience, the company has further expanded its capabilities with the addition of a second Ecospeed F – the more compact F 1540 – reinforcing its ongoing commitment to innovation, precision, and growth.

Founded in 1941 as a wartime job shop, Notthoff Engineering has grown steadily over eight decades to become a highly specialized aerospace subcontract manufacturer. As CEO Kelly Kaller explains: "Notthoff Engineering is a small, family-owned machine shop that has grown over the years, and we produce high-speed, monolithic structural airplane parts as well as helicopter components." Around 80% of production is aluminum, with titanium, Inconel, and other hard metals making up the balance. The parts span a wide range of structural aerospace components, from ribs, stringers, and formers to fuselage sections. As COO Arnie Juarez illustrates: "To give you an example, we recently had a billet that weighed about 3,085 kg, but when we shipped the part out, it weighed 86 kg. That is 95% material removal, and that is common for us." Operating from a four-building facility covering approximately 6,000 m² in Huntington Beach, the company's program portfolio features some of the most significant U.S. defense aircraft of recent generations. "Most of the work we do is military. We work on the F-35 and F-47, and we did a lot of work on the F-18 back in the day. The F-16 also still has a lifespan that we support – we're involved in a lot of programs," says Arnie Juarez. As a next-generation fighter, the F-47 project highlights the company's expanding role in cutting-edge U.S. defense manufacturing.

Starrag – a decision based on evidence

When Notthoff assessed horizontal machining centers in the early 2010s, Arnie Juarez was meticulous, visiting reference customers across Europe to observe different machines in actual production settings. What he discovered was compelling. "The Starrag sales team invited me to Ireland to see another company that had some of their machines operating. We spoke to everyone at the company, and they all praised Starrag. They were even installing two additional machines. We then visited another machine tool manufacturer in France, and upon arrival, the machine was undergoing maintenance. I spoke to a few individuals there, and

they mentioned numerous problems with the machines. Our decision was almost made," says Arnie Juarez. But the decision was not simply about reliability by contrast.

The more Arnie Juarez investigated the Ecospeed's technical architecture, the more convinced he became. The key differentiator was the patented Sprint Z3 parallel kinematic head. "What I really liked about the Starrag was the kinematics. Most of the big horizontals from other manufacturers have these big, heavy rotating heads, and they're really slow. They wind and unwind, and you lose a lot of cycle time. With the Sprint Z3 head on the Starrag, it goes from zero to 40 in a split second. The machine just keeps running. The acceleration and deceleration are excellent, so we can produce parts much faster with this machine than with any other machine on the market."

The technology behind the performance

The Ecospeed F Series is Starrag's specialized solution for high-speed milling of aluminum and soft-metal structural parts. Both the 2060 and 1540 models feature the Sprint Z3 head, a parallel kinematic system that achieves 1G acceleration across all five axes with jerk values up to 200 m/s³, allowing rapid positioning without compromising accuracy. Tim Mooney, Starrag's National Sales Manager and aerospace specialist, describes the machine in characteristically direct terms: "It's the fastest, most powerful machine out there – 30 to 40% more efficient than every other machine because of the Sprint Z3 head." The spindle specification underpins that claim.

The Ecospeed runs at 30,000 rpm with a 120-kW-spindle and a base speed of 13,800 rpm – the point at which full power is available. Tim Mooney explains why this matters: "Cutting aluminum structures is all about power. If you achieve full power at a lower RPM, you can use a much larger tool, which means a wider cut, a deeper cut, and your maximum hourly metal removal rate increases. None of our competitors can match that." The Sprint Z3 head covers ±45° of travel, encompassing approximately 95% of aluminum structural part requirements. When the right-angle head is loaded through the automatic tool changer, the machine effectively becomes a 6-axis platform, extending the stroke to 135° and allowing undercuts, side drilling, and other challenging geometric features to be completed in a single setup. For thin-walled aluminum structures, the light mass of the Sprint Z3 head – approximately 200 kg for the spindle assembly, compared with two to three tons for a traditional fork-head spindle – provides a decisive advantage. "With a very light mass to control, thin walls don't become a problem because we can accelerate through them," says Tim Mooney. "We can control the cut throughout and get through the corners quickly, which eliminates vibration."

Two machines, one strategy

The Ecospeed F 2060, installed in 2013, has a work envelope of 2,000 mm by 6,000 mm, enabling Notthoff to machine some of the largest structural components in aerospace production. More than a decade later, that original machine continues to perform to specification. "This machine was installed in 2013, so 13 years later we're still making good parts," says Arnie Juarez. "We haven't had any major overhauls, and it still holds tolerances within 25 micrometers."

> With the Sprint Z3 head on the Starrag, it goes from zero to 40 in a split second.
>
> **Arnie Juarez,** COO Notthoff Engineering

95 %
technical availability

> With this machine, we can deliver on time with excellent quality.
>
> **Arnie Juarez,** COO Notthoff Engineering

The newer Ecospeed F 1540 features a work envelope of 1,500 mm by 4,000 mm. Instead of duplicating capability, the two machines form a complementary pair. "Rather than tie up the big machine with smaller workpieces, it allows us to move that work over to the Ecospeed F 1540 and keep them both running, using them in the most efficient way possible," explains Arnie Juarez. There are also technical differences that make the pairing especially practical.

The Ecospeed F 2060 uses minimum quantity lubrication (MQL) with biodegradable oil mist delivered through the spindle, while the Ecospeed F 1540 uses flood coolant. This enables the West Coast company to optimize each machine for different parts and conditions. The dual-pallet configuration on both machines guarantees maximum spindle uptime. "We have one pallet in the machine running parts while the engineers are preparing the other pallet for the next job," says Arnie Juarez. "They load the tools into the tool changer while the machine is operational, update the program, and return the machine to cycle immediately." The pallet change takes just 120 seconds, and both machines run 24/7, powered by the Siemens 840D Solution Line control, with all programs validated using Vericut simulation before reaching the shop floor.

Delivering on quality, time, and cost

For Kelly Kaller, the value of the Starrag investment comes down to spindle time, efficiency, and competitive capability. "This new machine gives us a nice edge by being very efficient. It adds a lot more capability and capacity to our shop," he says. For Arnie Juarez, the competitive advantage comes from production speed. "The machine allows us to deliver on time with excellent quality, and customers get parts at a really good price because we can machine parts much faster than our competitors." The Ecospeed's self-calibration function also supports quality assurance, reducing reliance on operators. "The new machine has a feature that allows it to self-calibrate, which takes a lot of responsibility away from my operators because it's built into the machine." The machines also directly support compliance with the latest Boeing manufacturing specifications.

"The new requirements from Boeing and other customers specify that you have to do everything in the same setup. We have a 90° head on these machines that is stored in the tool carousel and automatically loaded, which effectively makes the machine 6-axis and allows us to put all the holes in at the same time without having to perform secondary operations," explains Arnie Juarez. "We have a leg up because we know that we can deliver parts that meet the most stringent requirements in a timely manner."

Service and support: the partnership difference

For Arnie Juarez, the quality of after-sales support was central to the purchasing decision and remains the main reason Notthoff chose Starrag again for the Ecospeed F 1540. "There's nothing worse than buying a machine and finding out afterward that there's no service support," he says.

Starrag currently has more than 850 machines installed across the U.S. market.

"Starrag has always been really good, and that's the reason we bought the second machine. They've always stood behind their product. They're very involved and very responsive. They genuinely understand that when your machine is down, you're not making money, so they're on top of it straight away." The service infrastructure includes remote diagnostic capability, allowing Starrag's engineers in Germany to log directly into the machine control and diagnose issues in real time. When on-site attendance is needed, response times are rapid. "If there's nothing they can do remotely, they send a service technician, and he's usually here within 24 to 48 hours at most. A lot of things can be fixed over the phone," says Arnie Juarez. Starrag currently has more than 850 machines installed across the U.S. market, supported by a team of service engineers from its factories, positioned strategically throughout the country, as well as approximately US $ 2 million in spare parts held at its Hebron parts facility. Tim Mooney summarizes this approach: "We're a solution provider, not a company that drops a machine off and walks away. Whether it's the service aspect to keep the machine at 95% technical availability or the applications team programming it the right way to maximize material removal, the people are really important."

Defense growth and what comes next

With U.S. defense spending increasing and build rates on major programs accelerating, Notthoff Engineering is well positioned for growth. The company already has work scheduled for both machines and is evaluating options for additional capacity. "We like to grow organically," says Arnie Juarez. "We're kind of out of space. We have four buildings fully occupied with equipment. We've either got to dispose of some of the older equipment or invest in another building, which is a very real possibility."

Tim Mooney confirms that around 90% of Starrag's U.S. aerospace clients focus on defense applications and that the Ecospeed satisfies all strict government specifications as standard. The relationship between Notthoff and Starrag, which has lasted more than 12 years, exemplifies the partnership philosophy Tim Mooney describes: "When Starrag sells a machine to a customer, it's not just about selling a machine. It's about building relationships and supporting each other over the years – we're in it for the long haul."

Starrag paves the way for Wilson

to start a new era of precision machining

Jiangyin Wilson Precision Equipment Co., Ltd. (Wilson) is a high-tech company specializing in the machining of medium-sized and large precision components. Wilson is an important supplier of the wind power, compressors, machine tools, and textile machines industries, among others. With increasing market requirements of quality and precision, as well as in the course of global industrial modernization, Wilson decided to consistently increase its production systems in order to remain competitive over the long term.

With the purchase of a Dörries vertical lathe with 4,000 mm diameter, Wilson laid the foundation for a successful development.

Successful entry to finishing of wind turbines

"In 2013, we decided to enter precision machining for the wind power industry – the start of our collaboration with Starrag", remembers Gao Wenjie, Deputy CEO of Wilson Machinery (Taixing) Co., Ltd. The extremely high requirements of shape and position tolerances could no longer be fulfilled with the existing machines. The large-dimensioned Dörries vertical lathes from Starrag provided the necessary precision and stability.

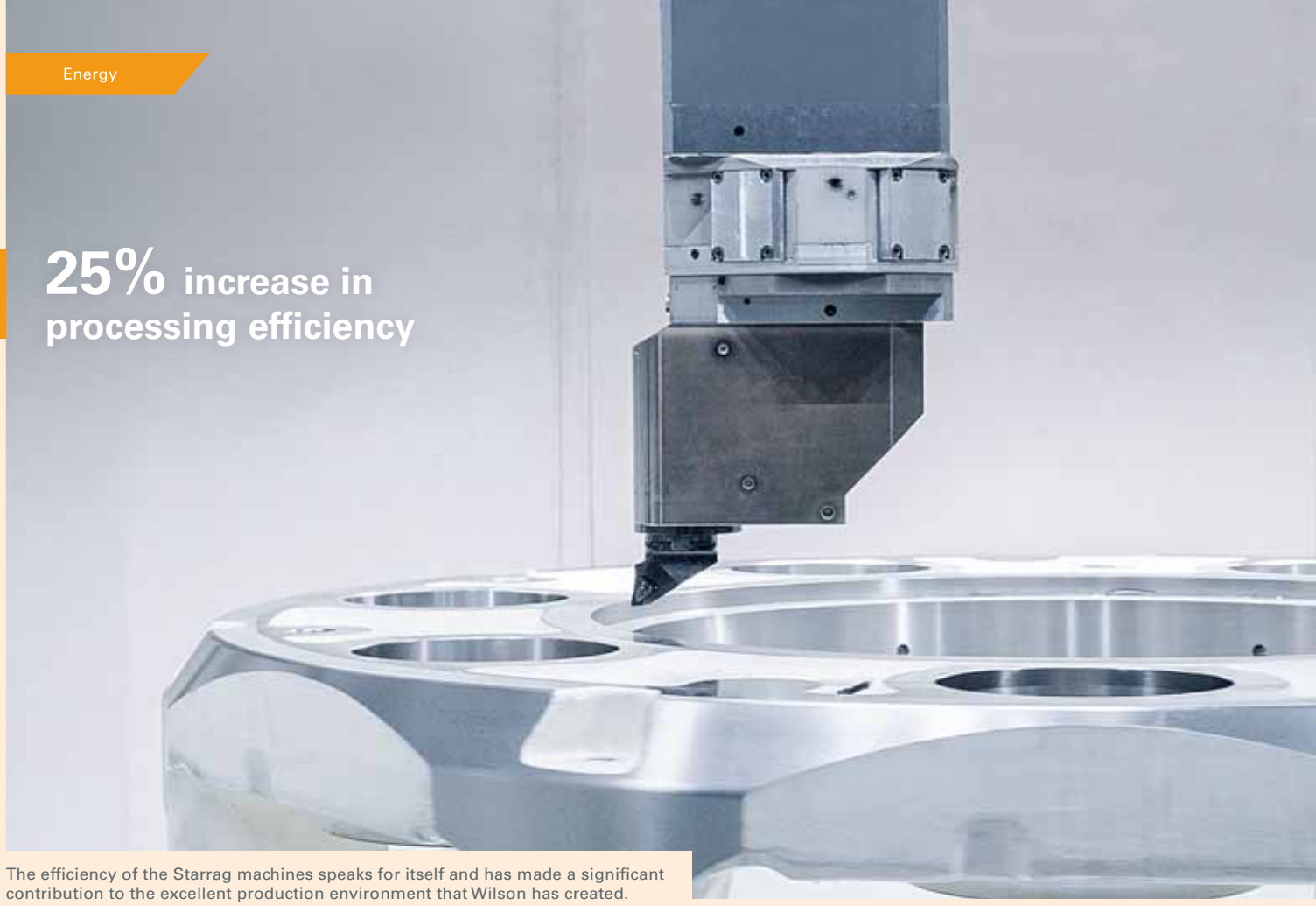
With the purchase of a Dörries vertical lathe with 4,000 mm diameter, Wilson laid the foundation for a successful development. Even after more than 10 years this machine continues to impress with high accuracy, efficiency, and reliability. "The excellent output of the Dörries machine far exceeded our expectations and supports the dynamic development in precision machining for the wind power industry and thus created a solid basis for further collaboration between Wilson and Starrag", explained Gao Wenjie. "In 2024, when we were faced with the important decision of modernizing our machines, we immediately chose Starrag again and ordered nine machines, including Dörries vertical lathes and Heckert horizontal machining centers."

Continuous development: Finishing of wind turbine components from Wilson takes another step forward

The Dörries vertical lathes fulfill not only the strict requirements of shape and position tolerances for precision components in wind turbines, but also significantly improve the product quality and production efficiency realized by Wilson thanks to their technical strengths. The linear drive systems designed for precision and heavy-duty cutting have hydrostatic guides.

This means that vibrations can be effectively reduced. Also in the case of long-lasting, high loads, these lathes retain their high rigidity and thermal stability and ensure continuous, high-precision output. Equipped with multifunctional tool heads, combined with a multifunctional tool magazine, they enable miscellaneous machining processes such as rotating, cutting, drilling, and grinding. Compared to similar machines, the machining efficiency is increased by more than 25%, whereby lead times for important components are reduced considerably. They also come with a flexible tool supply system for quick tool change and a modern digital control system. This enables automatic

> **"The excellent output of the Dörries machine far exceeded our expectations."**
>
> **Gao Wenjie**
> Deputy CEO of Wilson Machinery (Taixing) Co., Ltd.



25% increase in processing efficiency

The efficiency of the Starrag machines speaks for itself and has made a significant contribution to the excellent production environment that Wilson has created.

machining, reduces manual interventions, and improves production efficiency. "The output of these Dörries vertical lathes is crucial for the machining of large precision components in the wind power industry", explained Zheng Weidong, Head of the Equipment Department at Wilson Machinery (Taixing) Co., Ltd. "The excellent precision and efficiency of the Dörries vertical lathes facilitated the entry into the finishing of wind turbine system components and will also continue to drive this development forward."

Heckert horizontal machining centers: Precision in heavy-duty cutting

Production is complemented by Heckert horizontal machining centers, which are designed for high-precision heavy-duty cutting. They machine workpieces weighing up to 13 tons with exceptional accuracy. Straightness and flatness deviations under 7 µm as well as position deviations below 0.02 mm are achieved within a machining range of two meters. "The dimensional accuracy and surface roughness of the machined workpieces reach a new level and thus satisfy all our requirements in relation to product accuracy", adds Zheng Weidong. In addition, both Heckert horizontal machining centers have a tower magazine for large and heavy tools. It allows tool diameters up to 950 mm, tool lengths up to 800 mm, as well as tool weights up to 50 kg, thus increasing the machining efficiency for demanding applications with high tool requirements considerably. Integrated anti-collision systems ensure high process reliability, efficiency, and stability. The efficiency of the Starrag machines speaks for itself and has made a significant contribution to the excellent production environment that Wilson has created. Wilson uses a unique foundation structure, which provides extreme stability. In conjunction with precise temperature control, it offers excellent conditions for many highly complex machining tasks, which can only be realized with difficulty for other machines and competitors.

"The excellent machines from Starrag are the driving force behind the improvement of our machining performance. They are not only unrivaled in terms of their output, but are also characterized by outstanding reliability and stability in long-term operation, allowing us to be optimistic about future development", sums up Gao Wenjie.

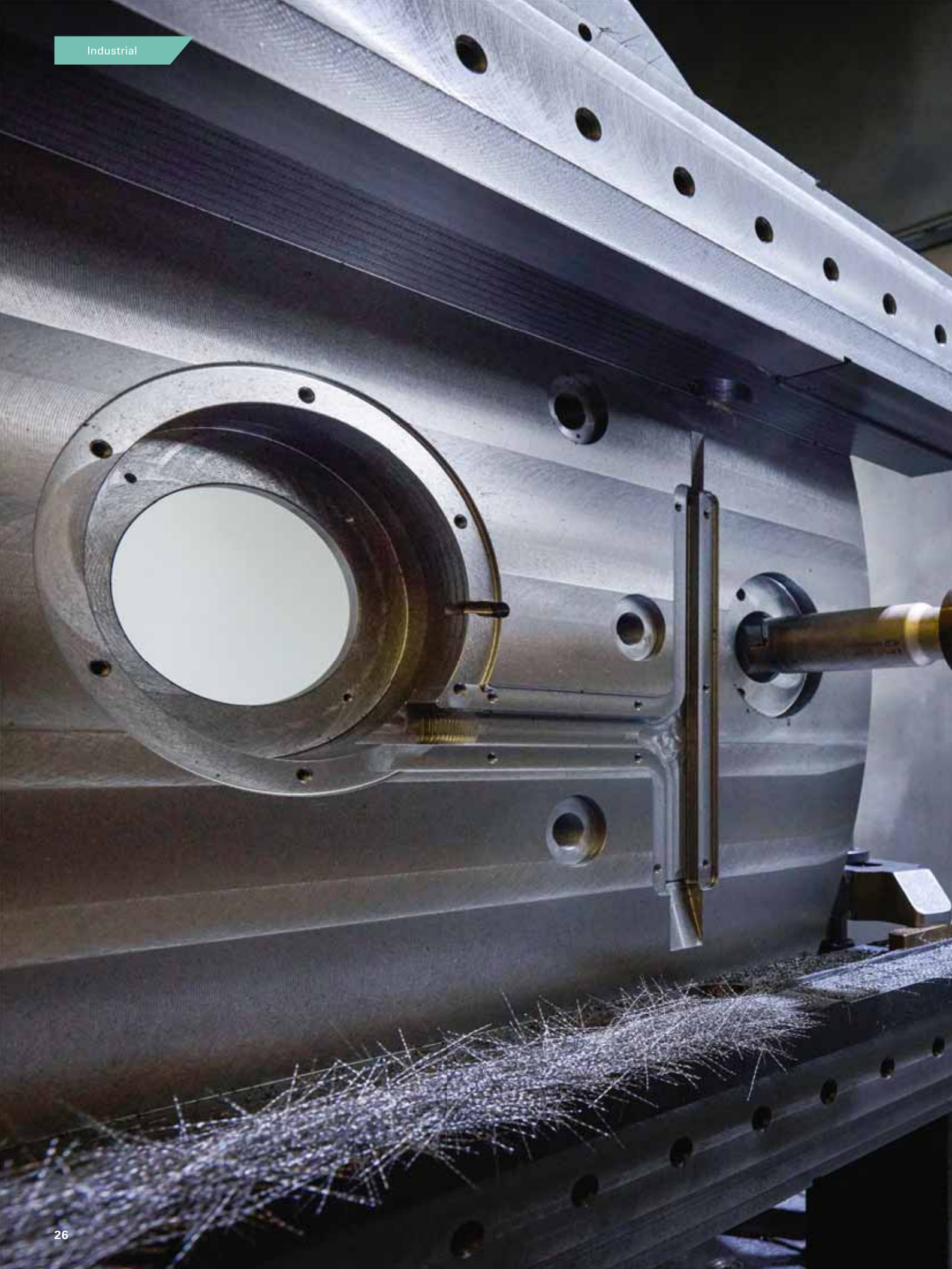
Mutual cooperation: The start of a new era in precision machining

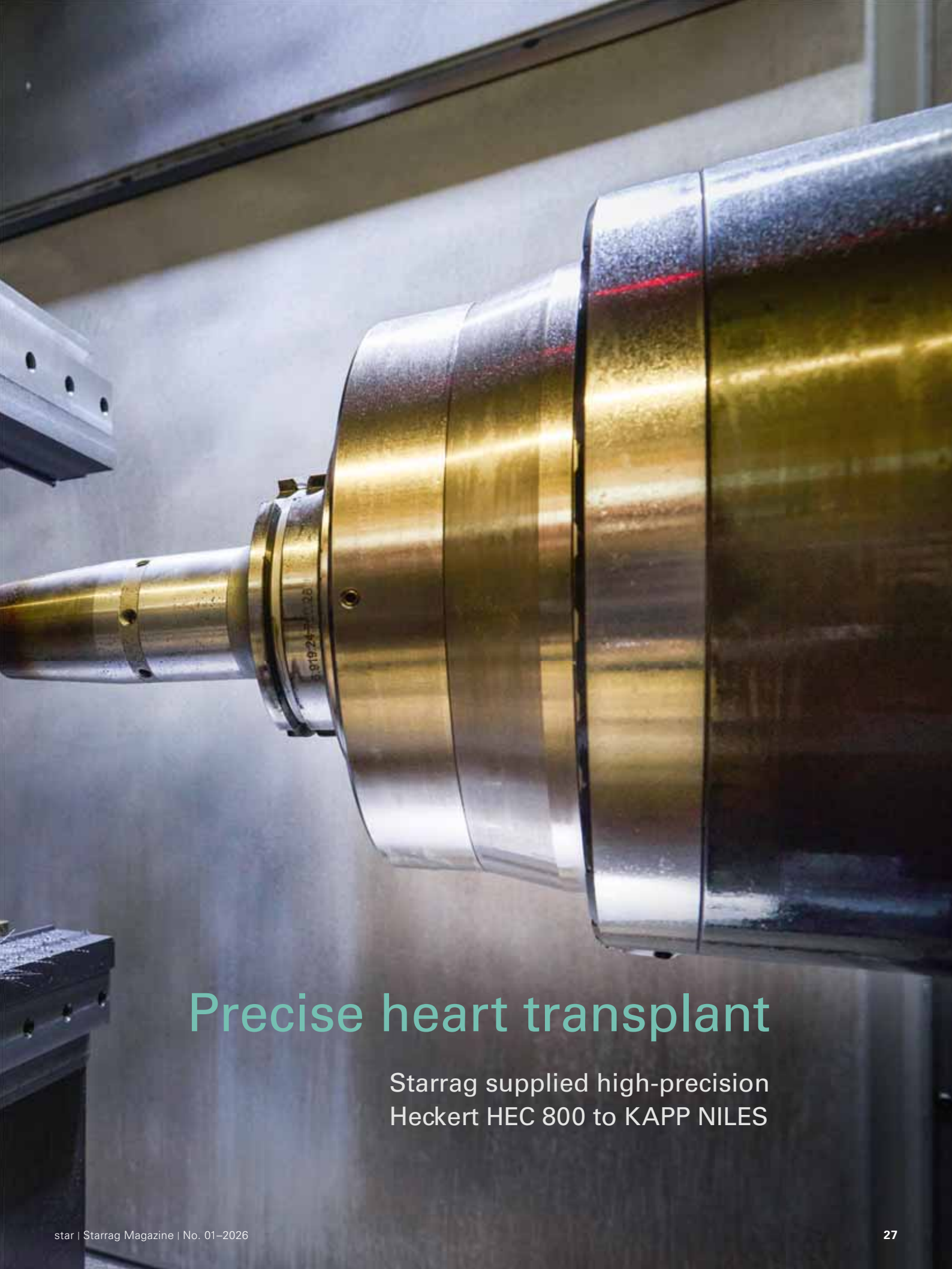
The cooperation between Starrag and Wilson is based on mutual trust and understanding, technical expertise, and the close correlation of both partners in relation to corporate culture and philosophy. "In the course of the collaboration the Starrag team demonstrated a high degree of professionalism and expertise. The team members not only used their global industry experience taking into consideration the characteristics of the Chinese market in order to provide professional advice, but also completed the installation and maintenance work on schedule and flawlessly in terms of quality and quantity, meaning we weren't faced with any worries", says Gao Wenjie, praising the Starrag team. Tony Liu, General Manager of Starrag Group China, highlights that Wilson is a company that attaches huge importance to innovation, quality, reputation, and longevity. This clear positioning aligns very well with the corporate culture of Starrag. Thanks to the joint efforts of both sides, it was possible to establish high-precision, efficient, and stable production for wind turbines based on the local Chinese market.

> **"The excellent machines from Starrag are the driving force behind the improvement of our machining performance."**
>
> **Gao Wenjie**
> Deputy CEO of Wilson Machinery (Taixing) Co., Ltd.

Starrag and Wilson will consolidate their partnership and continue to develop precision manufacturing. The next level is to be reached with innovative technologies and high-performance plants. Starrag looks forward to also working alongside Wilson in the future in order to further increase the high quality already achieved by the Chinese production industry and herald a new era of precision machining.

The next level is to be reached with innovative technologies and high-performance plants.





Precise heart transplant

Starrag supplied high-precision Heckert HEC 800 to KAPP NILES

In addition to the already high basic accuracy, the high-precision kit, which Starrag offers for its Heckert machining centers, was another decisive factor.

In 2024, KAPP NILES, a specialist for gear grinding machines, replaced a jig boring machine for precision finishing in its Coburg production facility. The new machine: a high-precision Heckert HEC 800 machining center. For Sascha Forkel, Head of Cubic Machining, the exchange was akin to a heart transplant: "It is a key machine in our production operations, without which we would no longer be able to supply." It is now clear that the operation was a success!

A glance into the production halls of the Coburg-based KAPP NILES factory clearly suggests that special machines are developed here. "Order and cleanliness as well as a high-quality machine fleet are the prerequisites to build our gear grinding machines", says Sascha Forkel. Under his management cubic parts up to one cubic meter in size are machined here: "These are key components for our machines, which are used for the high-precision manufacture of toothing and profiles." Each one of these components must adhere to extreme shape, positional, and dimensional tolerances of up to 3 µm so that KAPP NILES machines can satisfy the high customer requirements. In the end the toothing should mesh into the gears exactly and quietly – whether in the automotive industry, mechanical engineering, or in other applications. The components – made from up to 80 per cent cast iron, the rest is made from steel – are pre-machined by Forkel's team on various machining centers. An allowance of 0.3 mm remains on all areas with quality requirements. Bore holes maintain an extra 1 mm in diameter.

Then it gets complicated, as the cutting expert explains: "During the finishing process we operate in tolerance ranges of a few micrometers, not only in shape and position, but also in the positions relative to each other. The surfaces must also be of the highest quality."

The heart of production

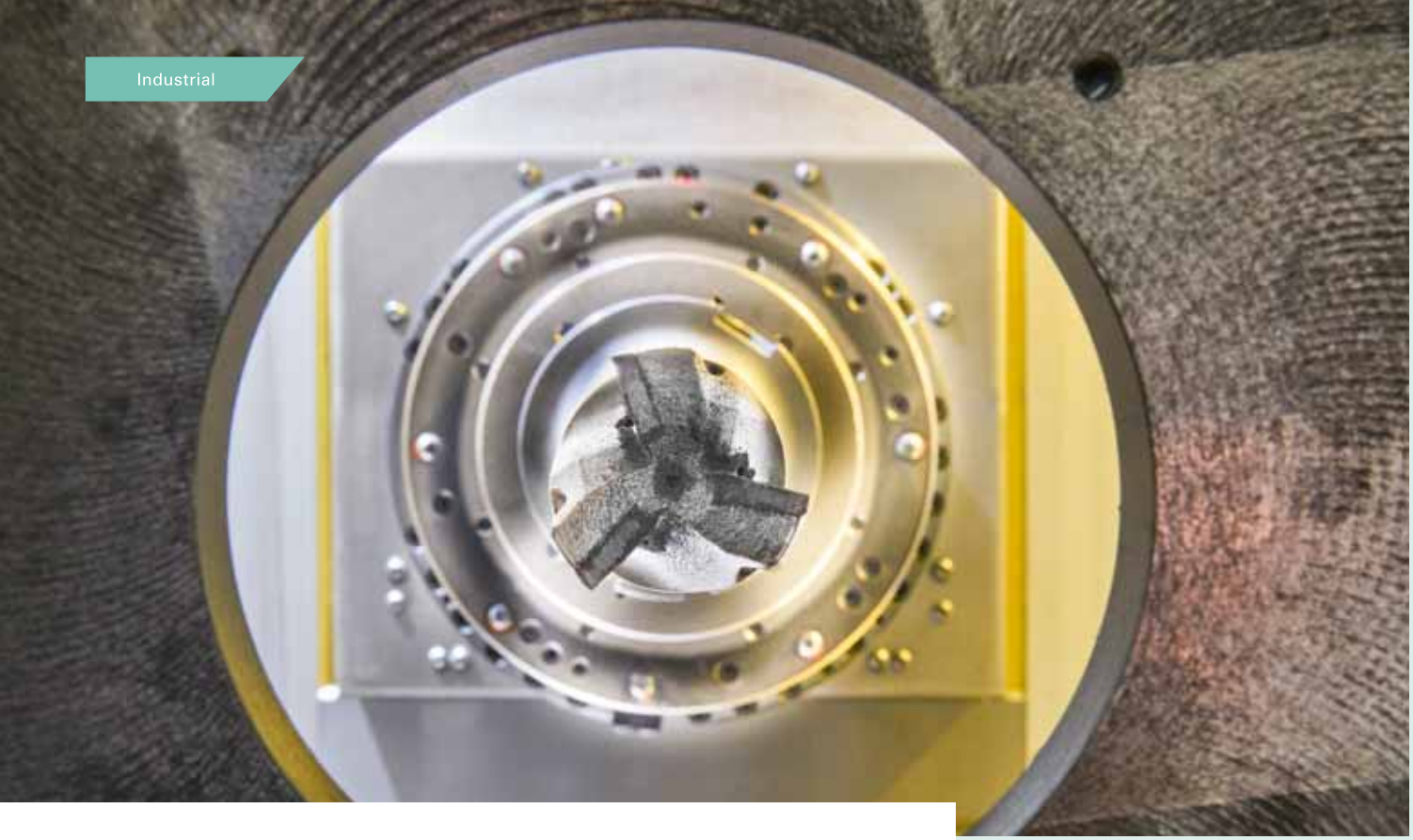
Up until recently this task was undertaken by a 16-year-old jig boring machine, for which, however, the supply of spare parts was no longer guaranteed. The failure risk and associated extended production downtime were too high for the persons responsible. They preferred to arrange an exchange as a precautionary measure.

> **"Heckert machining centers already have high mechanical accuracy."**
>
> **Rainer Krause**, Area Sales Manager Starrag

Top priority: Like its predecessor, the new machine must guarantee reliable precision cutting in the micrometer range. Following a market analysis KAPP NILES shortlisted three suppliers. The machine operators were also included in the selection process. They selected the most challenging component for trial machining runs: a complex motor housing. The three shortlisted machines were tested under identical conditions: same component, same pre-machining, same clamping devices, same NC programs and tools. The machine operators from KAPP NILES clamped the pre-machined parts for the machine manufacturers in order to achieve comparable results across the board. "Experienced machine operators and NC programmers who work on the machine are required", highlights Sascha Forkel. "The machine will be the new heart of our production, but it is not solely responsible for success. Only when the machine, operator, and NC programmer work together in perfect harmony can the components be manufactured with high precision." For the final assessment, all three sample components produced were measured on the same measuring machine at KAPP NILES. "Following the measurement results and taking into account other technical details. We decided on the supplier Starrag and the Heckert HEC 800 machining center, equipped with the high-precision kit and other add-ons promoting accuracy", reports Sascha Forkel.

Mechanical accuracy versus software compensation

Apart from the measurement results, the mechanical accuracy of the machine was a decisive selection criterion. Rainer Krause, the Area Sales Manager at Starrag who is responsible for KAPP NILES, explains: "Heckert machining centers already have high mechanical accuracy. It is in a tolerance range that is only half the size of what is typical for machining centers."



“A special relationship of trust was established on this project.”

Sascha Forkel, Head of Cubic Machining KAPP NILES

Sascha Forkel confirms this. He points out that various manufacturers have similar accuracies for their machines; however, this is based on compensation in the control software. In his experience this can cause problems: “One example: We generally produce bore holes on this machine with single-edged tools. The compensation in several axes can cause warpage, meaning the bore hole is not cylindrical. This is a no-go for us.” In addition to the already high basic accuracy, the high-precision kit, which Starrag offers for its Heckert machining centers, was another decisive factor. Water cooling for stands, axis drives, and ball screws ensures the thermal resistance of the machine. The water is cooled or heated so that it maintains the default temperature in the range of ± 1 K. All heat sources such as motors and hydraulics are also protected from the accuracy-relevant components of machine stand and bed. Another component of the kit is hand-trimmed guides which ensure optimized positioning accuracy.

Development in detail

Starrag Area Sales Manager Rainer Krause describes the procedure once the order has been placed: “We developed the offer from a technological perspective so that KAPP NILES can represent its entire range of parts with our Heckert HEC 800.”

All measures were secondary to the topic of accuracy. For instance, the Chemnitz-based designers further restricted the tolerance of the circular axes and in particular reduced the wobble of the B-axis. Because the KAPP NILES cutters must add bearing bore holes from two sides, which requires the highest possible indexing accuracy.

For the spindle, KAPP NILES chose a direct drive solution developed by Starrag. "The smallest inaccuracies of a gear spindle would have been too much for us", argues Sascha Forkel. "We even limited the maximum speed from 12,000 rpm to 10,000 rpm in order to achieve higher process reliability."

The rapid traverse rate and acceleration ramps were also reduced to avoid machine vibrations where possible. Rainer Krause highlighted the close cooperation with Sascha Forkel and his team: "We discussed a great deal in this phase and specified the plans down to the last detail – through to the gentle positioning of the pallet on the set-up point. Because if this is done too roughly, vibrations occur which continue into the machine." Another relevant point was the accessibility of the machine. The machine operators wanted practical and safe access to the machining area for set-up and measuring tasks. As a result, steps, handrails, and a platform in front of the machine were designed. The entire operating peripherals were lifted accordingly. An automatic drilling system was also implemented.

"We developed the offer from a technological perspective so that KAPP NILES can represent its entire range of parts with our Heckert HEC 800."

Rainer Krause, Area Sales Manager Starrag

Automation for uncritical parts

The addition of an automation system was planned right from the start. "Our goal was to be able to machine uncritical parts without human interaction", explains Sascha Forkel. "As we had no experience with pallet automation, we were totally reliant on Starrag's expertise here." As Starrag works with various automation partners, the local conditions were decisive for the recommendation. Rainer Krause explains: "Taking into account the spatial conditions at KAPP NILES, an Erowa LoadMaster system was chosen. With a pallet station for nine workpiece carriers, it promised the largest capacity-related advantage."

Pallets are one of the core competencies of the Chemnitz-based machine manufacturer, as Rainer Krause emphasizes: "We manufacture them ourselves. Their impact on the accuracy produced on the workpiece is too high. For KAPP NILES, we supplied a total of nine pallets, six of which are in a standard design, i.e. precision milled and sanded, and three hand-milled for particularly challenging components." The Heckert HEC 800 with Erowa LoadMaster now occupies the same size footprint as the predecessor machine – with increased efficiency. "As planned, uncritical components are machined in a fully automated operation. These are parts with tolerances of 10 µm and higher, i.e. with H6, H7 fits." KAPP NILES jargon: rough machining.

"Our goal was to be able to machine uncritical parts without human interaction."

Sascha Forkel, Head of Cubic Machining KAPP NILES

“Only when the machine, operator, and NC programmer work together in perfect harmony can the components be manufactured with high precision.”

Sascha Forkel, Head of Cubic Machining KAPP NILES

Trust – an important business principle

Sascha Forkel is convinced that he has found the right partner with Starrag and the Chemnitz-based Heckert specialist. “It is an advantage when medium-sized mechanical engineers work together. Both sides know what they are talking about and what matters. A special relationship of trust was established on this project.” Visits to the Chemnitz factory and Heckert reference clients were also a contributing factor. The extent of that trust was reflected in particular in the retrofitting. Instead of the originally planned gradual operation from jig boring machine to the Heckert machining center, the persons responsible decided on a hard cut, which Sascha Forkel describes as follows: “We dismantled our old machine in July 2024. We then had two weeks for preliminary work in the hall because the Heckert HEC 800 arrived on time in the middle of August.” The site acceptance test took place in November, and after an introduction phase it went into production from January 2025. “Granted, the cut was a bold move”, says Sascha Forkel. “But through the close contact with the Chemnitz-based Starrag experts, we assessed the risk as relatively low that anything would go wrong during the exchange and the new Heckert would not deliver from the beginning. Our conclusion: The heart transplant was a complete success.”

See more
in the video

Big Bang in production

New production system with four Heckert H75 machining centers guarantees edge in productivity

For almost 20 years PÖTTINGER has been relying on an automated plant with four machining centers and pallet rack system in mechanical production.

Agricultural machinery manufacturer PÖTTINGER exchanged an aging flexible production system in just twelve weeks. This feat was made possible through the collaborative partnership with machine supplier Starrag and automation specialist PROMOT. The core element of the new, highly efficient solution is four Heckert H75 machining centers, which together with the pallet rack system supplied by PROMOT along with a production control station enable highly flexible and continuously digitalized production.

PÖTTINGER Landtechnik GmbH, Grieskirchen, Austria, manufactures machines and equipment for grassland, farming, and digital agricultural engineering. Whether it is mowing units, loading vehicles, plows, cultivators, or assistance systems and software – all products are cutting-edge technology. Jörg Lechner, Head of Production and Materials Management, says: "As a family-owned company, we attach importance to sustainability, quality, and long-term thinking – values which are directly reflected in our production philosophy."

This includes as a central principle highly flexible production with the capability to deliver solutions to customers' specific requirements. Instead of producing to stock, all products are manufactured in a weekly cycle and can be adapted depending on market demand. This can be clearly seen in the manufacture of plows, where the variety is so huge that there are hardly two identical machines. The PÖTTINGER Engineering Department provides the basis for this customization with a cleverly designed modular system, which enables the late creation of variants and just-in-time manufacturing despite high complexity. For almost 20 years PÖTTINGER has been relying on an automated plant with four machining centers and pallet rack system in mechanical production. Thus, for a long time PÖTTINGER was a pioneer in flexible production. But five years ago the time had come to find a new solution that would once again push the company ahead in terms of production technology.

On the search for a robust, precise, and flexible production system

The range of parts to be produced is huge: It extends from simple lugs made from structural steel with a weight of around 300 g through to complex gearbox housings made from cast blanks weighing up to 27 kg. Welded frame parts with a length of almost 900 mm also have to be cut on the plant. The required precision is also challenging. For instance, µm tolerances must be observed for gearbox housings. Iskender Merkezoglu, Head of Mechanical Production, explains: "This requires both robust and precise machining centers."

A retrofit of the old plant was quickly dismissed as this would have taken too long. Problems would also arise from different software versions. Instead, PÖTTINGER decided on a complete exchange during ongoing operations – a "Big Bang".

Machine manufacturer Starrag was awarded the contract with its horizontal machining centers Heckert H75. The machines developed in the Chemnitz factory impressed with their larger working space and collision circle diameter with a smaller

footprint at the same time compared to corresponding machines. "This is an important advantage taking into account our confined spatial conditions. Also looking into the future, because our parts will probably grow in size and complexity", adds Iskender Merkezoglu. Raimund Hohensinn, who is responsible for overall production at PÖTTINGER, adds: "The Starrag high-end machining center is also extremely energy-efficient, which really suits us. Because at PÖTTINGER we attach huge importance to the economical use of energy."

As an automation partner, PÖTTINGER chose PROMOT Automation GmbH, Roitham, who together with Starrag offer a decisive advantage: tool management with optimal price-performance ratio. "For its Heckert H75 machines, Starrag offers an affordable tool magazine with 260 positions," says Iskender Merkezoglu. "As PROMOT can link the magazines of the four machines via its 'Toolmaster' gantry loader, 1040 tools in total are available to us. We can exchange them between the four machines as required." This saves costs and opens up new opportunities in production planning. Because the production control system can reassign the components to a free machine at any time and with minimum effort. Iskender Merkezoglu points out that the tool data on each machine is also available immediately. This is made possible by a Balluff chip recorded by the presetting device and integrated in the toolholder.

"In the end the deciding factor for the Starrag/PROMOT solution was the complete package of technology, efficiency, and cooperation", sums up Production Manager Raimund Hohensinn. "Starrag assisted us greatly in the project phase and provided answers quickly. This created trust. The same also applies to PROMOT. As a team, we worked really well from the project planning stage through to commissioning."

Digital twin and simulation software enable short commissioning and start-up phase

PÖTTINGER assumed the coordination and allocated the individual trades directly. The role of the integrator fell to the automation specialist PROMOT, who integrated the four Heckert H75 in a high-bay warehouse with 134 slots on five levels – operated by the Palmaster FFS1500 stacker crane. The flexible production system also contains four Vario set-up stations, two of which can be tilted with a motor. The brain of the plant is the master computer supplied by PROMOT, which communicates with SAP and controls the entire production process.

Mario Hamedinger, who is responsible for programming and production planning at PÖTTINGER, played a key role in the project team. He recognized early on that the tight time frame of only twelve weeks for the exchange of the plant could

"Starrag offers an affordable tool magazine with 260 positions for its Heckert H75 machines."

Iskender Merkezoglu
Head of Mechanical Production,
PÖTTINGER Landtechnik GmbH

only be observed with digital support. He suggested enlisting the support of Pimpel GmbH, Scharnstein, and their CHECKitB4 software. The software makes it possible to start up NC programs at a CAM workstation on a virtual control.

Starrag provided the digital twin of its Heckert H75, which maps machine and control exactly. As a result, it was possible for the Pimpel software to simulate the ISO code graphically, check the feasibility of the components, and highlight potential errors of the control – months before the actual machine installation.

> "This saves us at least one minute of production time per pallet change, which equates to almost 20% of the cycle time."
>
> **Mario Hamedinger**
> Programming and Production planning,
> PÖTTINGER Landtechnik GmbH

In addition, Starrag supplied the four Heckert H75 in the Chemnitz factory beforehand so that programmers and machine setters from PÖTTINGER could already test all component machining operations under real conditions long before the delivery. "My colleagues and I were in Chemnitz for around four weeks to start up the programs", reports Mario Hamedinger. "Without the digital twin and CHECKitB4, we would never have been able to adhere to the retrofitting time frame of twelve weeks."

Component cleaning outside the machine results in increased productivity

Mario Hamedinger also recognized a need for improvement in the process chain and the associated savings potential. Because up to now the flushing process of a finished workpiece took place in the machine. "Our aim was to take the flushing step out of the machine", explains Mario Hamedinger. He was supported by Starrag and PROMOT. They made it possible that the machined workpiece is now transferred to a set-up point in the warehouse via a rotary table. This set-up point has automatically closing gates as well as flushing nozzles for air and cooling liquid. The cleaning takes place there, while the machine is already working on the next component. "This saves us at least one minute of production time per pallet change, which equates to almost 20% of the cycle time", says Mario Hamedinger happily. "An enormous gain in productivity, without having to reduce the milling times." PÖTTINGER also modernized the infrastructure during the retrofitting. Instead of a decentralized solution, a central coolant supply with a volume of 8,500 liters is now used. This increases process reliability, reduces the maintenance effort, and creates advantages in daily operation.

Iskender Merkezoglu, Head of Mechanical Production, mentions another strength of the Heckert H75, which pays off for future operation: "Starrag gives us a so-called fingerprint for these machines, with which we can request all important machine data on site without service technicians. We send the data to the Starrag factory in Chemnitz, where specialists generate a report or analysis for us within one day." Through the comparison with historical

data and test sites, it is possible to assess from when vibration values become critical and what measures need to be taken. Such data-based diagnoses enable precise planning of maintenance measures and reduce unplanned standstills.

One single large machine with four machining points

The site acceptance test for the new flexible production system took place after twelve weeks. The start-up in ultimate production mode happened in a few weeks thanks to the parallel run-in of the individual machines. During this time the programmers and machine setters were still working on fine tuning the machines.

Because the machining centers must be exactly the same in order to give the master computer the option to optimally distribute the orders and not make a distinction between machines A, B, C, D. In order to ensure this equality in machine assembly and in the working area, each of the four machines is set up with the same master pallet. As a result, a production system is created that basically works like a single large machine with four machining points. This is also taken into consideration in production planning and control: In the SAP system each machine does not exist separately, but only one workstation that is planned centrally. Managing Director Jörg Lechner not only sees the technical achievements as decisive for the success of the project, but also the people behind them. "The success is based on the fact that employees assume responsibility and actively work together on the further development of the processes", highlights Lechner. "The most important thing for us is that we manage to take people on the journey. Everyone contributes something – and that's not because it is required, but because they are passionate about it." In particular, he highlights the partners involved, who acted on an equal footing and with a great deal of mutual trust, as well as the staff at PÖTTINGER, whose commitment contributed significantly to the success of the project.

"The success is based on the fact that employees assume responsibility and actively work together on the further development of the processes."

Jörg Lechner
Head of Production and
Materials Management
PÖTTINGER Landtechnik GmbH

Starrag drives manufacturing excellence at Smithstown

Nestled in Shannon, Ireland, Smithstown Light Engineering has experienced a remarkable transformation over the past 50 years. Founded in 1974 as a traditional toolmaking business under the leadership of Brian King, it has grown into a global medical device powerhouse with over 300 employees. Today, with three sites across Ireland and Poland, the company produces millions of precision components each year, with the Starrag Bumotec 191^{neo} taking its place as the cornerstone of its New Product Introduction (NPI) strategy.

"Brian King was a champion toolmaker in Ireland, winning awards and building a reputation for precision & quality" explains Gerard Henn, CEO of Smithstown Light Engineering. "That customer-focused philosophy, where you could call him at 10 pm with a problem, and he'd be there the next day – that's the foundation we've based everything on."

When Brian's son Gerard became Managing Director in 2011, he recognized the cyclical nature of tool making was challenging especially after the 2008 recession. Already involved in clamps, fixtures, and instrumentation for surgical procedures that provided a repeat business model, a change of direction was being surgically strategized. "In 2018, we were still making mold tools, but the decision was clear. We exited mold tools to focus on medical device manufacturing."

Ireland's medical device landscape

The West Coast of Ireland has established itself as a European hub for medical device manufacturing, with major players including Stryker, Zimmer, DePuy, Boston Scientific and Medtronic all maintaining significant operations on the Emerald Isle. Today, approximately 90% of Smithstown's business comes from Ireland-based operations, with the remaining 10% split between the US and Central America. However, that international percentage is growing as the reputation spreads. "When there's a supplier review meeting in the US or wherever, we're often invited to bid. Our name moves around based on our reputation," Gerard Henn notes.

Shrinking components and tighter tolerances

With medical device components getting smaller, more complex and requiring tighter tolerances that pushed traditional manufacturing approaches to the limits, Smithstown set about acquiring suitable machine tools like the Starrag Bumotec 191^{neo}. This was because parts that once measured 100 mm+ were shrinking to dimensions requiring magnification to inspect. "If you look at some of the components we are making now, you literally need glasses to see them properly. These are complex medical devices with multiple operations like cross-drilling, chamfering, tight internal radii, and critical surface finishes both inside and out. Many require tolerances in the three to five micron range on production runs, not just prototypes," Gerard Henn continues.

"Four or five years ago, we would break into our manufacturing resource to make customer prototypes. What was supposed to be two days often became four weeks with a production machine out of manufacturing for a month," Gerard Henn recalls.

With 10 to 15 NPI programmes running simultaneously across both the Shannon facility and Poland, the constant interruption to manufacturing was challenging. "We weren't making our numbers. We'd lose two weeks here or six weeks there.Something had to change."

A dedicated NPI facility

The solution required both organizational and technological change. Smithstown established a dedicated NPI department with its own equipment, separate from production manufacturing. However, the specified equipment needed to handle the most complex geometries possible. This is where the Starrag Bumotec 191^{neo}

stepped up to the plate with its 60-tool changer, main spindle and retake vice, and the 12.2 kW, 26,000 rpm B-axis machining head. "We needed something for all the multiple operations. Something that could handle very complex geometries with tight tolerances."

Smithstown's technical team, many with 25 to 35 years of experience, attended exhibitions like EMO and maintained dialogue with suppliers. Starrag emerged as a potentially key supplier for several compelling reasons. Aside from the brand prestige in multiple industry sectors, one reason was the medical industry reference customers in Ireland and a machine permanently located at the Irish Manufacturing Research (IMR) facility. "We started asking questions like, what's your service level? What's your warranty? How many machines do you have in Ireland?"

Why the Starrag Bumotec 191neo?

The relationship developed gradually over several years before an order was placed. Alexandre Gelfer, Starrag Vuadens SA's representative for the UK and Ireland, played a crucial role. "We showed Alexandre a range of parts, and we wanted a machine that could cover most of that range," notes Flávio DeCampos, Smithstown's Manufacturing & NPI Leader.

Several key factors drove the final decision to order the Starrag Bumotec 191neo in January 2025. First was the machine's fundamental capability of a 5-axis machining center integrated into a turning environment. "With the Bumotec 191neo, you're putting a 5-axis inside of a turning center. This gives you the capability to handle complex parts with the tightest of tolerances. In one machine platform, there are twelve possible configurations where you can have up to 7-axes and three spindles," Flávio DeCampos explains. Second was the compact footprint relative to its work envelope. Third was flexibility for unknown future requirements. "We needed the Rolls-Royce of machines for NPI work, the Starrag Bumotec 191neo is certainly that machine. We knew the first NPI machine would be the center point for future operations, and only a brand as prestigious as Starrag would deliver that," Gerard Henn emphasizes.

"We really drilled into everything with Starrag. We asked what the machine can do? What are the standard and special options? Throw it all at us and let us talk it through. We discussed what we needed, what was available, what they were already supplying to customers, and what they thought we should consider. We agreed on a machine with 60 tools, a main turning spindle with a B-axis milling head and a retaking unit with a vice for collecting the parts for machining the final operations."

Strategic impact

Since delivery, the Bumotec 191neo has rapidly become the cornerstone of Smithstown's NPI strategy for the next decade. "NPI is the business for two years out. If we're not in there now and working on new products, we're not going to have any business later," Gerard Henn emphasizes.

The dedicated NPI department now functions independently, removing conflicts and delays caused by breaking into production capacity. "If NPI needs five weeks for development, that's on them. They're not affecting production, and customers don't see any impact." The commitment to Starrag isn't a one-time investment. "We're not going to buy one this year and something different next year.

Dr. Gerard Henn
CEO Smithstown Light Engineering

Flávio DeCampos
NPI Manufacturing Manager

"I can't do anything but complement Starrag. The dialogue, the patience, transparency and responsiveness all stand out." Dr. Gerard Henn

We have a state-of-the-art facility with incredible technology and a growth trajectory. We will add a second Bumotec, and a third, and we'll go beyond that, as and when our business requires it."

First production experience

The first component tested on the Bumotec 191^{neo} was a medical device for a global manufacturer. "We'd made similar pieces on a sliding head turning center, but this new part was far more complex. On turning centers, we would've had multiple setups. Now it's bar stock in, and the finished part out – that has to be the case with complex, tight-tolerance components. We can't afford to do second operations on machining centers, as we have in the past."

The geometry of these parts pushes boundaries. "We're talking about profile tolerances of three to five microns on what will eventually be production parts. On other machines, we wouldn't be able to hold that. We can hold those tolerances with the Bumotec, even when doing complex production machining," Flávio DeCampos notes.

The medical component has undergone nine design iterations. "There's been eight design changes in six months. We've been producing batches of 5,000-off through each of these iterations. We needed a machine capable of handling that variability from the start – and now we have it. When it enters full production, we could be talking about 10 to 20 million parts, but in the medical sector, this commercial work might be a few years away. When that time comes, we must have our processes 100% nailed-on to maintain the extremely tight tolerances required for volume production. The Bumotec provides us with that process stability and precision that most machines cannot match, while offering the flexibility to complete complex parts in a single process," says Gerard Henn.

Outstanding performance

The Smithstown team has experience in using some of the most prestigious machine tool brands in the market, but Bumotec has genuinely impressed. "The consistency is what stands out. Holding tight micron tolerances with all the kinematics running is an area where other machines start to lose consistency, not on the Bumotec 191^{neo}."

This capability has changed Smithstown's approach. "Some tapers have such tight profile tolerances, we question whether this should be a milling or grinding operation, but the Bumotec handles it all in its stride," says Flávio DeCampos. The machine runs two shifts, with 24-hour capability when needed. Current cycle times are around 15 minutes per part. "We're confident we could work at least 20% faster and maybe cut cycle times by upwards of 30% when we're more experienced with the machine and strategies," says Flávio DeCampos.

Installation, commissioning and training

Commissioning preceded smoothly with support from Stefan Narnhofer, Starrag's commissioning engineer. "Stefan was phenomenal. He was so fastidious and dedicated. What more do you want from a supplier?" Gerard Henn adds. "Stefan participated in the factory acceptance test, installation, commissioning, and returned for CAM refinements. We maintained continuity – the same guy who understood

The user friendly HMI significantly reduced the learning curve.
(Jean Carlos Guedes, 5-axis milling specialist)

our operations and processes," Gerard Henn continues. The training program was equally effective for the three staff members operating the machine. "One thing that stands out is how user friendly the HMI is. To understand all the axes clearly when the milling head moves around exemplifies how easy it is to use. The difference compared to other machines is considerable, and the graphic display is incredibly intuitive," Flávio DeCampos explains. This intuitive interface significantly reduced the learning curve. "The guy did one week of training and was able to come back and start cutting parts immediately," Flávio DeCampos notes.

The learning curve ahead

Both Gerard Henn and Flávio DeCampos are candid about being early in the learning journey. "There's a lot to learn about how to get more out of the machine," Flávio DeCampos acknowledges. This sparked discussions about advanced training. "I rang Claude Ballif, Sales Manager at Starrag Vuadens, and asked how we drive this technology forward, and Claude's immediate response was that every customer returns for a second phase of learning when they are competent with the machine. As every customer wants to push the boundaries of what is possible – and the Bumotec allows us to do that," adds Gerard Henn.

Claude explained that users initially program based on experience with other machine types. "Bumotec is far more powerful than that. Users need to change their strategies and approach machining from a completely new direction of boundless possibilities," Gerard Henn says. Flávio DeCampos agrees: "The guy programming the machine came from a 5-axis background. For guys using 5-axis, they're focused on milling and don't think about turning in the same machine, this effectively requires a mindset change by both our machinists and our development teams." Looking back, Gerard Henn is emphatic in his praise: "I can't do anything but complement Starrag. The dialogue, the patience, transparency and responsiveness all stand out. For our project engineering team, the Bumotec 191^{neo} is becoming the first choice machine for complex medical device components."

Conclusion

The strategic decision to establish a dedicated NPI department, along with investment in Starrag Bumotec 191^{neo} technology, positions the company for ongoing growth in one of the world's most demanding manufacturing sectors. "You hear lots of great things about the Swiss watchmaking industry and how heavily involved Starrag are. When I look at some of our parts on a CAD screen and the minuscule dimensions, I can see why. The ability to throw anything at this machine is fantastic," Gerard Henn continues.

With tens of millions of components produced annually and an expanding presence across Ireland and Poland, Smithstown has a clear strategy, and the addition of more Bumotec machine tools in the future is assured. "If we are not at the table for the next bid; if we can't handle the most complex parts our customers can envision, we're not going to be in business in five years. The Bumotec gives us that capability. It's the Rolls-Royce of our NPI operation, and as we learn more about what it can do, it's going to help us win the programs that keep this business growing for the next 50 years," concludes Gerard Henn.

20% faster

"We're at least 20% faster and cut cycle times by upwards of 30% when we're more experienced with the machine and strategies."

Flávio DeCampos
NPI Manufacturing Manager

STRUB MEDICAL: precision in the service of vision

The decision to purchase the Tornos SwissNano 7 marks an important step forward for Strub Medical GmbH & Co. KG in its efforts to achieve even more efficient production of high-precision microsurgical instruments. With owner and managing director Marco Müller at the helm, the company is taking on the challenge of manufacturing microcomponents from titanium – a strategic expansion made possible by the reliability, repeatability, and exceptional ergonomics of the SwissNano 7.

STRUB MEDICAL has traditionally specialized in surgical instruments made of stainless steel – from microscissors to endoscopic instruments.

Marco Müller and Sven Martin (Tornos) in front of the SwissNano 7, at the heart of the micromachining project developed at STRUB MEDICAL.

Based in Neuhausen ob Eck, Germany, the company employs around 100 people and has a modern machine park.

> "Our strength lies in controlling every step of the process ourselves."
>
> **Marco Müller**
> Managing Director, STRUB MEDICAL

A company with tradition and innovative spirit

Based in Neuhausen ob Eck, Germany, the company employs around 100 people and has a modern machine park with three Escomatic lathes, eight computer numerical control (CNC) lathes – including the SwissNano 7 – and state-of-the-art CNC milling machines. Thanks to this cutting-edge infrastructure, is able to manufacture workpieces of exceptional quality and precision. Rooted in the medical technology region of Tuttlingen, a global center for surgical instruments, STRUB MEDICAL combines traditional craftsmanship with state-of-the-art manufacturing technology. With Marco Müller, a passionate and visionary managing director, the company has continued to develop and now controls over 90% of its manufacturing processes – turning, milling, grinding, and manual finishing – to ensure consistently high quality.

"Our strength lies in controlling every step of the process ourselves. This enables us to ensure perfect reproducibility – a decisive factor in our field," Marco Müller explained. As an industrial engineer specializing in lean management, Marco Müller has shaped a corporate culture at STRUB MEDICAL that focuses on innovation and continuous development.

New challenges: titanium and precision

STRUB MEDICAL has traditionally specialized in surgical instruments made of stainless steel – from microscissors to endoscopic instruments. In 2023, the company ventured into a new field: the manufacture of delicate titanium turned parts, products of the highest complexity and precision requirements.

"The SwissNano 7 has enabled us to make a technological leap forward. It is a machine that inspires confidence, integrates perfectly into our production environment, and opens up new perspectives for us."

Marco Müller
Managing Director, STRUB MEDICAL

"This production was completely new to us. Titanium is an extremely demanding material. But with the SwissNano 7, we can achieve the stability, precision, and repeatability required for tolerances in the submicrometer range," Marco Müller emphasized. The requirements for cleanliness, fineness, and uniformity are so high that only a machine with exceptional thermal stability and sophisticated ergonomics can meet this challenge.

SwissNano 7: Tornos precision as the key to success

The SwissNano 7, developed for high-precision turning of workpieces up to 7 mm in diameter, marks a technological milestone for STRUB MEDICAL. Compact, energy-efficient, and ergonomic, the machine is ideal for workshops where every square meter counts. Thanks to its sophisticated design, the SwissNano 7 offers excellent accessibility: Adjustments, tool changes, and maintenance are effortless – a major advantage for operators. "What convinced us was the consistency of the results and the ease of use. Once the machine is set up, it runs for days without any deviation. Despite its compact design, it remains extremely stable and hardly heats up. That's impressive," Marco Müller said. In addition, its energy efficiency fits

In 2023, the company ventured into a new field: the manufacture of delicate titanium turned parts, products of the highest complexity and precision requirements.

perfectly into the company's environmental strategy: The SwissNano 7 consumes little power yet delivers consistent machining performance. This is a decisive advantage for STRUB MEDICAL, which wants to optimize its resources without compromising on quality.

> This decision has paid off: STRUB MEDICAL's expertise, combined with the precision and stability of the SwissNano, has opened up a new market segment for the company.

Precision as a growth engine

With the SwissNano 7, STRUB MEDICAL has successfully positioned itself in a demanding, high value-added market segment while reducing energy consumption and optimizing production space. The partnership with Tornos symbolizes the combination of precision craftsmanship and state-of-the-art industrial technology. "The SwissNano 7 has enabled us to make a technological leap forward. It is a machine that inspires confidence, integrates perfectly into our production environment, and opens up new perspectives for us," Marco Müller noted.

Precision and partnership as a recipe for success

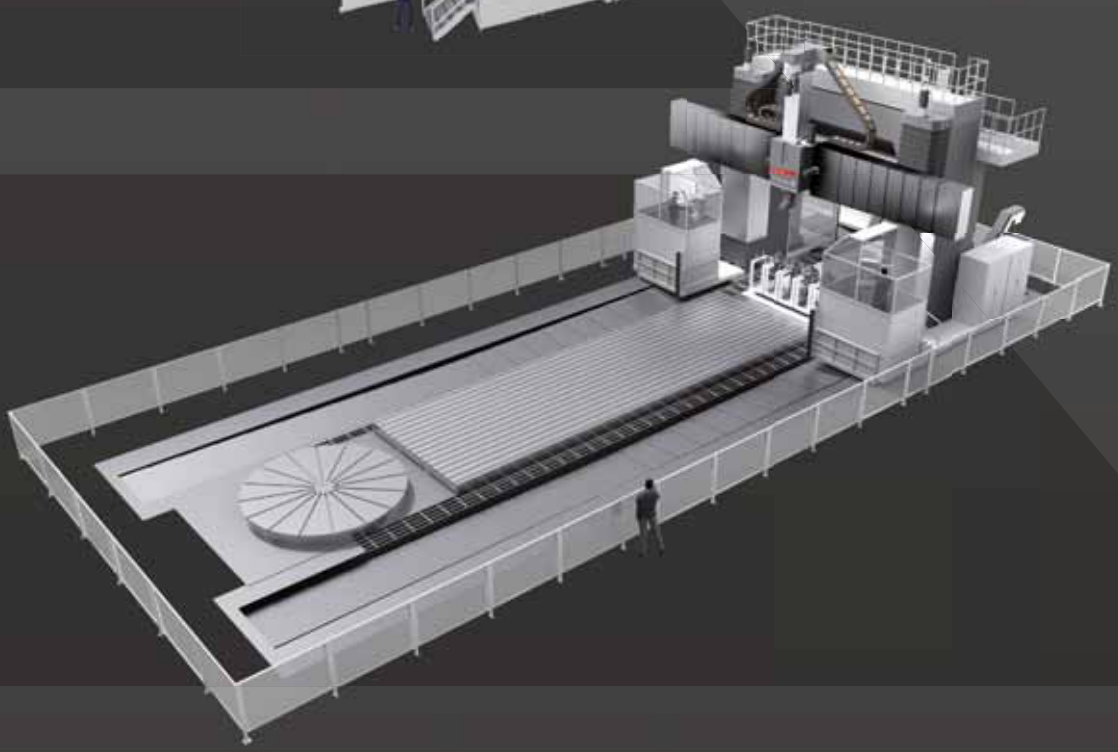
STRUB MEDICAL is located in the heart of a region known worldwide for its medical technology and precision manufacturing. Penetrating such a demanding field requires manufacturing technology of the highest standard – as offered by the SwissNano 7. This decision has paid off: STRUB MEDICAL's expertise, combined with the precision and stability of the SwissNano, has opened up a new market segment for the company. Tornos Germany always guarantees fast access to spare parts, support from experienced application engineers, and an outstanding sales team – ideal conditions for serving our customers, including STRUB MEDICAL. STRUB MEDICAL embodies the innovative thinking that unites all Tornos partners: competence, passion, ergonomics, and precision in the service of health and mechanical perfection.

starrag

Engineering precisely what you value

From very small to extremely large

We have the right machining solution



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