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star

Take-off at Lake Constance
Starrag and ZEISS welcome over 200 professionals to the Aerospace Technology Days 2022

The unveiling of a Starrag world first in Stuttgart: Heckert T55 five-axis horizontal machining center
Serial gear cutting and pointing

125th anniversary of Starrag in Switzerland
The milling cutters from Lake Constance

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Publisher:
Starrag Group Holding AG
Seebleichestrasse 61
9404 Rorschacherberg
Switzerland

Tel.: +41 71 858 81 11
Mail: info@starrag.com

Managing Director:
Dr Christian Walti

Editorial staff:
Sabine Kerstan, Christian Queens, Angela Richter, Michael Schedler, Elena Schmidt-Schmiedebach, Ralf Schneider, Stéphane Violante

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Dr Christian Walti
CEO of the Starrag Group

Dear reader,

Writing this editorial always brings me great pleasure because it always features interesting people.

If there is one businessman I wish I could have met, it would be Henri Levy from the Alsace region in France. He took over a locksmith's workshop in Rorschach in 1897 and his company started, with only a few employees, designing and constructing its own textile machines for the renowned hand embroideries of the Swiss Canton of St.Gallen. In this specific article, you can read about how his workshop survived the crisis in the textile industry by switching to machine tools. The naturalized Swiss citizen would certainly be proud of today's international Starrag Group which, in 2022, can look back on 125 years of turbulence and innovation.

In July, over 200 people attended the Aerospace Technology Days event. Together with ZEISS, we invited experts from the aerospace and energy industries to the event at Lake Constance. In addition to the many technical presentations, I was particularly fascinated by our guest speaker, Claude Nicollier, the only Swiss astronaut to date to have gone to space four times.

However, back on earth, we have exciting projects going on, as demonstrated by a meeting at our plant in Bielefeld. Henning Albrechtsen met with Hubert Erz, a senior consultant for sales in renewables, with whom the HACO Managing Director has worked in close collaboration for a number of years. Once again, they are working together, this time to construct two gigantic Droop+Rein portal machines which the Danish family-owned company will use to manufacture enormous rotor housings for wind power plants.

For Starrag, good cooperation starts even before the point of purchase. This was also picked up on by machinists from Swiss housing specialists Max Schilling when they visited our parent plant in Rorschacherberg to have their own parts tested and optimized on the five-axis machining center STC 800. Operations Manager Paul Oberholzer was full of praise for this: "the technological support was really first-class and considerably contributed to our decision to make a purchase."

Two world firsts were also influenced by enthusiastic collaborators. Read about the great passion shown by Del West Europe, a leading Swiss manufacturer of high-end precision products, in optimizing the Bumotec 191^{neo} from Starrag Vuadens. Also, worth readin is about the eagerness of Jonny Lippmann, Product Manager for the Heckert product range in Chemnitz, for "sensational projects" with the new Heckert T55 five-axis horizontal machining center.

I hope you enjoy reading this Star 02-2022

Christian Walti

Take-off at Lake Constance

Starrag and ZEISS welcome over 200 professionals to Aerospace Technology Days 2022

The Aerospace and Turbine Competence Center pulls in participants thanks to its manufacturing expertise

Exchanging information and pleasantries: The 200+ participants from 22 different countries were not only interested in ZEISS and Starrag's expertise, but also took advantage of the occasion to socialize with other professionals from the aerospace and energy industries.

"We invited ZEISS to the Aerospace Technology Days 2022 in order to combine high-precision manufacturing with the highest standards in quality assurance."

Dr. Christian Walti, CEO Starrag

Rorschacherberg – What does the new Aerospace and Turbine Competence Center have to offer? How do I optimize the production of my turbine blades and structural components? And what can be achieved through the closely interlinked interaction of measurement technology and machining? Answers to typical questions such as these from leading producers in the aerospace and energy industries were provided by Starrag and ZEISS in Rorschacherberg in the summer over the course of the three-day Aerospace Technology Days event.

"There wasn't a single well-known manufacturer of drives and structural components for aeroplanes and power plant turbines who wasn't present," reports a satisfied Dr Christian Walti, CEO of the Starrag Group. In spite of a pandemic-related pause, Starrag and its cooperative partner for this year, Carl Zeiss Industrielle Messtechnik GmbH, managed to attract more than 200 participants from 22 countries to Lake Constance for the long-standing insider meeting for production specialists in the aerospace industry and in power plant turbine construction. These included customers of both companies, who came from Europe, North America, Australia and New Zealand. The three-day event was made more appealing thanks to the cooperation with the manufacturer Carl Zeiss Industrielle Messtechnik GmbH, whose demonstrations at six of the 14 total stations ideally complemented Starrag's production technology. "One station milled a structural component precisely down to a few micrometers, and its contour was then checked at the next station using a large 3D scanner," recalls marketing manager Ralf Schneider. "This close interlinking of ZEISS measurement technology and Starrag machines at the Aerospace Technology Days is a good reflection of reality, since it also occurs in everyday industrial operations. We do the milling and ZEISS does the measurement." The device used in question was the optical ATOS ScanBox, which supports the manufacturing process with quick and precise measurements for quality control.

Machining and measurement in a single set-up

Starrag and ZEISS pragmatically demonstrated the seamless and swift nature of this interaction. Professionals from all over the world were impressed with how the process chain could be optimized and

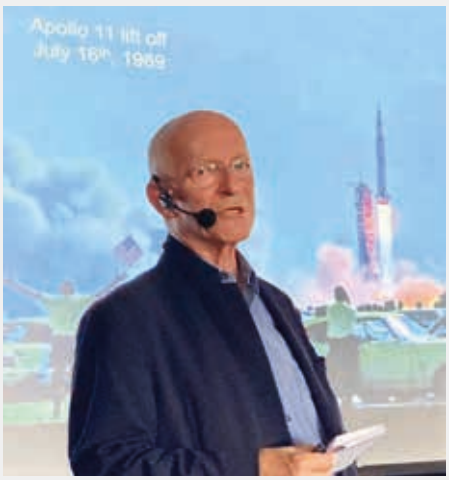
automated through simple measures: When planning a set-up, for example, not only the milling process, but also the quality check can be taken into account on a coordinate measuring machine. "By no longer needing to change the set-up, I save time, reduce potential sources of error, and improve process reliability," Schneider points out.

There was another interesting aspect that made this event stand out: While the Aerospace Technology Days are, as the name suggests, primarily aimed at professionals in the aerospace industry, representatives from the energy sector are traditionally also invited. This is because Rorschacherberg is the host to manufacturing demonstrations of turbine components that are not just used in aeroplanes, but also in power plants after undergoing slight modifications. Therefore, the challenges that occur are similar, and so representatives from both industry sectors have come to highly value the cross-sector interaction that the "Tech Days" offer ever since the beginnings of this event.

Welcome Ecospeed: A new addition to the Aerospace Competence Center

A particular highlight for the aerospace industry, however, was the demonstration on an Ecospeed F1540 with the machining of complex, large aluminum components. This horizontal machining center with its unique Sprint Z3 machining head with parallel kinematics is considered the most productive solution for the high-performance milling of monolithic aeroplane components made from aluminum. The Ecospeed F1540 is designed for machining long and narrow structural components using complex five-axis machining geometries. Thanks to the five-sided access to the workpiece, it is particularly suitable for highly complex components. At the Tech Days, Starrag demonstrated how quickly a highly complex component can be formed with deep rough machining at high speed (machining volume of 48 gallons (180 liters) per minute). The machining time is shortened

> "By no longer needing to change the set-up, I save time, reduce potential sources of error, and improve process reliability."
>
> Ralf Schneider
> Starrag Marketing manager
> at Rorschacherberg



A four-time veteran of outer space: Guest speaker Claude Nicollier, Switzerland's first astronaut, fascinated participants from the aerospace community and many other sectors with recollections of his four NASA space flights, which included trips to the Hubble Space Telescope.

Showcasing process knowledge instead of products: The focus of the demonstrations at the fourteen stations was not on machines, systems and methods, but rather on actual tasks encountered.

by the rapidly accelerating five axes and the parallel kinematic machining head. Even though high-performance cutting is used, the final machining quality and surface quality are so high that there is no need for manual post-processing. Consequently, the Ecospeed series has gained significant prominence among the worldwide aerospace community.

The demonstration of the Ecospeed F1540 was a statement from Starrag. It indicates that the development and production of the Ecospeed series has now been successfully relocated from Mönchengladbach to Rorschacherberg. The presentation of the Ecospeed was not just a première for the high-speed milling of large, complex aluminum structural components for the aerospace industry at the group's headquarters: Above all, it signalled the significance of milling with parallel kinematics for the new Starrag Aerospace and Turbine Competence Center, which now combines all the existing expertise within the company group on the development and production of turbines, turbine blades and structural components.

Securing the benchmark position

The first new Ecospeed machines for customers are already under construction at the headquarters in Rorschacherberg, while the Ecospeed F1540 is already being used in shift operation. Christian Walti summarizes the developments as follows: "We mill on the machine under real conditions, observe and optimize machining processes and measure wear and other characteristic values in order to develop the Ecospeed technology even further. Only by doing this can we ensure that Ecospeed will continue to serve as the worldwide benchmark for machining aluminum structural components."

The unveiling of a Starrag world first in Stuttgart: Heckert T55 five-axis horizontal machining center

"One machine for everything" is the principle behind Starrag's Heckert T Series. At the AMB 2022 trade show in Stuttgart, the company will be showcasing the second member of this series, the new HeckertT55 five-axis horizontal machining center with the typical rotary-drive unit. It is ideal for multitasking complete machining of drive elements weighing up to 1543 lb. (700 kg) for commercial vehicles, agricultural machinery and industrial applications. Another highlight is that even with the new heavier design, users can perform serial machining procedures, such as turning, milling, drilling, skiving and pointing in one clamping position on a single machine.

"Our range of multitasking machines includes heavy-duty workhorses for large, heavy parts," explains Jonny Lippmann, Product Manager for the Heckert product range in Chemnitz. "These have also been joined by the highly dynamic machines in our T series for a few years now," he adds.

Setting sights on new families of workpieces

This is the second highly dynamic machining center in this series. It all began in 2018 with the Heckert T45, which immediately opened up new families of parts. "Heckert T55 has the same DNA," Lippmann explains. "With its bigger brother, we're now moving to the next biggest range of workpiece families, where very different tool sizes, collision circles and loading dimensions play a role."

The two centers boast impressive DNA. Their new operating concept means that, just like a smartphone, they are ergonomic, easy and reliable to operate. Thanks to workpiece loading, they are easy to automate using pallet storage units or robots. Finally, they also have a narrow footprint. Lippmann notes that, "the Heckert T55 can easily be integrated into the customer infrastructure and therefore facilitates automation. This successfully manages the balancing act between complex parts and unmanned shifts." In addition, the integrated condition monitoring system with spindle diagnostics and collision and chip detection ensures maximum machine availability.

The Heckert T55 is a highly productive multifunctional machining center with a very compact, robust machine design and a low-vibration rotary-drive unit specially designed for turning operations – including a highly dynamic motor spindle (15,000 rpm, 292 Nm) with an HSK-T100 tool holder for a high chip removal rate. It also offers the same range of machining options for cubic and rotationally symmetrical components as the Heckert T45.

Debut: At the AMB 2022 trade show in Stuttgart, the Starrag Group will be showcasing the new, highly productive Heckert T55 multifunctional machining center for completely machining workpieces weighing a maximum of 1,543 lb. (700 kg).

Maximum productivity thanks to multitasking complete machining

The machine offers a high level of flexibility thanks to the quickly rotating NC table (900 rpm), which enables integration with rotationally symmetrical procedures, such as turning, turn-milling and skiving. The ability to completely machine certain drive elements, such as planet carriers, facilitates what is now serial gear cutting and the subsequent rounding of teeth (pointing).

Maximum productivity thanks to minimized productive and non-productive times

The machining center with a 97 hp (72 kW) motor spindle can even completely machine complex, larger components in a maximum of two set-ups – with comparable acceleration (max. 394 in./s² (10 m/s²)) and the same rapid traverse (3,120 in./min (80 m/min)) to the T45. Its dimensions have changed thanks to the larger pallet (20 in. × 25 in. (500 mm × 630 mm)) and increased travel distances (X/Y/Z: 34/40/39 in. (850/1,020/1,000 mm)). The Heckert T55 also machines workpieces with a much larger workpiece contour (36 in. (900 mm) rather than 24 in. (600 mm)) and weight (1,543 lb. (700 kg) rather than 882 lb. (400 kg)). What's more, in spite of these increased machining capacities, the chip-to-chip time has only increased marginally from 3.8 s to 4.3 s and the pallet change time has only risen from 12.5 s to 14.5 s.

Another strength is the automation that has already been demonstrated by the Heckert T45, particularly in larger projects. The Starrag plant in Chemnitz doubled the productivity of a manufacturer of drives, halved the machine's footprint and reduced tool and handling costs by 40%. This was achieved by combining two Heckert T45 machining centers and one robot to form a small manufacturing cell. This could manufacture twelve different components of a planetary gear train – each with two set-ups. "The customer wants to avoid reclamping operations, which are always associated with losses of accuracy, handling and manual operations," states the Product Manager. "It's now also possible to implement similar solutions with the Heckert T55 for larger planet carriers or wheel hub drives for trucks and other commercial vehicles. The Heckert T55 is therefore opening up amazing projects for us."

Targeting high-strength materials: Hard turning in Stuttgart

How can a machining center also machine critical materials, such as those made of cast iron or stainless steel, quickly and precisely to between six and three micrometers? The secret to success is the clever interaction between the temperature- and vibration-stable machine bed made of mineral cast and the double symmetrically mounted with a rotary-drive unit. Starrag will be demonstrating how dynamically and reliably the new machine from Chemnitz can machine even critical materials and components at the AMB 2022. It will do so using the Heckert T55 to hard turn high-strength materials and to machine a complex part from the mould construction.

The millers from Lake Constance: Starrag has been based in Rorschacherberg for almost a century now. Oskar Hoppe and Henri Levy (right) proudly presented the factory floor to wife Rösli and other family members in the 1920s.

125th anniversary of Starrag in Switzerland

The milling cutters from Lake Constance

Without them, certain ships would not travel, many planes would not get off the ground, and numerous power plants would not work reliably: There's plenty that's made possible thanks to the Starrag Group from Rorschacherberg in Switzerland. The group is known and valued not just by aeroplane manufacturers, shipbuilders and energy companies from all over the world, but also production experts from almost every sector. It's an astounding achievement – especially since it all began 125 years ago, with an automatic threading machine for the textile industry.

A gold medal in Toulouse! The trained businessman from France's Upper Alsace region certainly couldn't have dreamed of that, back when he was still selling machines to owners of world-renowned hand embroidery firms in the Swiss canton of St Gallen. As a newly naturalized Swiss citizen, Henri Levy was fascinated by the work of these embroidery firms; however, he disagreed with the laborious process of manual threading, which often had to be carried out by children. In 1897, at just 27 years old, the sales manager took over a locksmith's workshop and became the inventor of a threading machine that he designed and built with his employees.

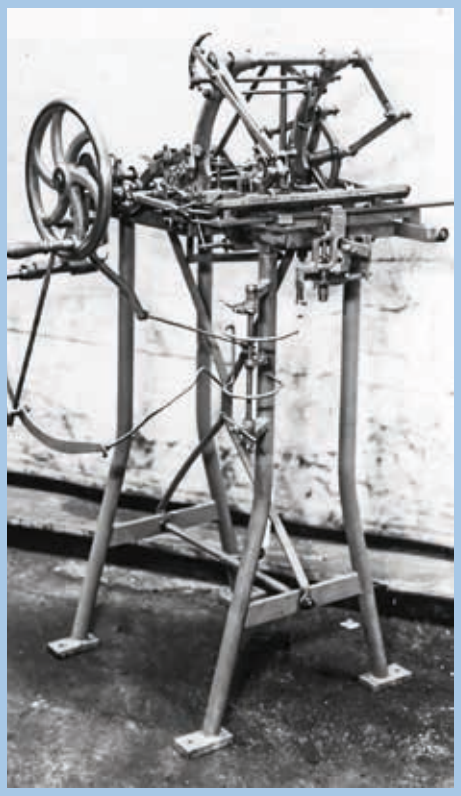
The arrival of the concept caused a stir in the textile industry: Ten years later, Levy received a gold medal for the invention at the international industrial exhibition in Toulouse. Shortly after, the 3000th threading machine left Henri Levy's mechanical workshop in Rorschach. A number of other textile machines followed, which were met with similar success. However, a few years later, when the steadily sinking demand for embroidery from St Gallen had begun to jeopardize the future of his business, he instead turned his focus to lathes and vertical spindle moulders.

Spurred on by a German inventor duo

The real turning point came in 1917, when the German inventors Oskar Hoppe and Richard A. Kempin paid a visit to Levy's company. The pair proposed that he should build a prototype for a rigid milling machine with a closed frame, for which they

Henri Levy, Company founder

Oskar Hoppe, Inventor



Well threaded: Company founder Henri Levy took over a locksmith's workshop in 1897 and became the inventor of a threading machine that he designed and built with his employees.

possessed a German patent. Levy was convinced by the design, and just two years later, the invention turned out to be a blueprint for a successful product – which was used by the workshop, now renamed Starrfräsmaschinen AG ("Rigid Milling Machines AG"), to conquer the booming automotive industry in particular. A few years later, the public limited company had to grow to employ around 400 people, and so had to move to a larger factory in neighbouring Rorschacherberg.

The rigid milling machine was built on the same recipe for success that has defined the Starrag Group to this day: The Swiss-based machine building company was very thorough in selecting a design principle that they could continue to refine and sell until it was superseded by a new and better design. The company remained true to the design that the inventor duo in its employ had proposed for 48 years, until the construction of the rigid milling machines was finally brought to an end in 1967.

Papa Levy: Fatherly concern for Starrag's employees

"Papa Levy" – as he was affectionately known – left a company to his descendants upon his death in 1947 that was not only a shining example of how to run a business, but also of how to be socially responsible in doing so. In the 50 years following the company's founding, a number of paternal-like acts of responsibility towards his employees showed why he'd earned the nickname "Papa": At the beginning of the 20th century – 1903, to be precise – he was one of the earliest employers to set up a health insurance programme, which was subsequently followed by a company pension fund and a group insurance scheme. This sense of social responsibility was also upheld by successors such as Jean Schaufelberger and Manfred Widmer, who generously provided the workforce with a canteen, an apprentice workshop and a school for technical draughtsmen, among other initiatives.

The quarter-century that followed Levy's death led to a number of innovations in Rorschacherberg that would shape the company's continued success in the long run. In 1956, Starrag began constructing machines for milling turbine blades, which paved the way for the company to enter the aerospace and energy sectors. When it comes to manufacturing blades for aircraft engines or gas/steam turbines, the most sought-after factor is a high level of surface quality, which is dependent on the machining accuracy. This was reason enough for the Swiss machine builders to equip their copy milling machines from 1961 onwards with NC magnetic tape controllers, which contributed above all to additionally increased precision when milling turbine blades.

Withstanding the test of the oil crisis

These investments turned out to be crucial for the company's survival when, around a decade later, at the beginning of the 1970s, the first oil crisis brought

"Starrag is an engineering company that has always succeeded in adapting to changing market conditions."

Walter Fust

Walter Fust, Majority shareholder

many export-oriented companies such as Starrag to a near halt. The Swiss company came a little too close to feeling "The Limits to Growth", as per the title of a contemporary report that was published by the Club of Rome in 1972. Nevertheless, Starrag saw opportunities for five-axis NC machine tools, with which components could be manufactured in their entirety in a single set-up via a particularly sustainable and productive process. This resulted in the NB 125 D, which was able to mill simultaneously in five axis – a remarkable feature for a machine that was launched in 1973. This level of complexity is particularly sought after in the milling of impellers for aircraft engines and turbo engines.

The investment paid off: The aircraft manufacturers Rolls Royce and Construcciones Aeronáuticas ordered new NC special machines. Thanks to this specialization, Starrag also won General Electric in Lynn, Massachusetts and founded its own subsidiary there, in order to provide better support to its new customer base in the USA. It was an important step along Starrag's road to what it has grown into today: An international company group with production sites in Switzerland, Germany, France, the United Kingdom and India, as well as sales and service companies in all key customer countries.

More challenges to face in the 1980s

Nevertheless, Starrag faced more setbacks along the way, but consistently overcome these through its innovative capabilities. The global recession of 1982, which saw extreme increases in oil prices – a consequence of the war in Iran – led to the Rorschacherberg-based firm shifting their focus to automation. This was a move quite in keeping with the times, since comprehensive digitalization had already begun to reshape the factory environment: "Computer integrated manufacturing" (CIM) was one such term that defined this period. Starrag adopted this concept for its new CNC machining centers in the new NX series for milling impellers and turbine blades. Thanks to the automated handling and the self-designed tool system, the non-productive times of these machines were able to be drastically reduced. However, the "cherry on top" for this CIM strategy turned out to be the self-developed software – which proved beneficial for applications such as inclined tool machining. The clever interplay of machines, automation and CAM software allowed customers to achieve enormous rationalization effects of 50% and more. Under a new director appointed in 1986, the strategy made its way to the customer base: Roughly every fifth machine was already automated and, thanks to open control systems, able to be networked with other manufacturing systems. It formed the basis for subsequent flexible manufacturing systems, for which Starrag even supplied self-developed master computers.

A key milestone in Starrag's history came when Walter Fust took up a significant role within the company as majority shareholder and member of the supervisory board. As an 18-year-old grammar school student, Fust had already become very familiar with the company through giving a presentation in English on the machine tools produced by Starrag and +GF+. It left a lasting impression on him, since – after completing the Matura, the school leavers' exam – he went on to study mechanical engineering at the Swiss Federal Institute of Technology in Zurich (ETH Zurich). As a young entrepreneur, he began purchasing shares in Starrag as early as the 1970s and regularly read through the company's reports. At the end of the 1980s, he acquired a substantial share package that allowed him to play an active role in determining the company's future. The qualified mechanical engineer had come upon an engineering company that had "always succeeded in adapting to changing market conditions". Nevertheless, he also

criticized the technical infatuation of the research and development department, feeling that it was not sufficiently oriented to the market.

Marking a new beginning in Chemnitz

"We can't afford gimmicks." Such was the maxim of the new president of the supervisory board, yet he did not shy away from risks when they were "well-considered". In 1998, he purchased the Chemnitz-based company Heckert GmbH, which was one of the largest machine building combines in East Germany with over 50,000 machine tools sold. The Rorschacherberg and Chemnitz sites now operated together under the new company name of StarragHeckert – which, among other things, allowed them to produce more quickly, more precisely and more cost-effectively under a joint platform strategy. In retrospect, Fust considered it to be a perfect decision.

Together with the new CEO, Fust initiated subsequent company takeovers from 2005 onwards. In their acquisitions, the pair strategically targeted specialists in manufacturing software (TTL), high-precision measurement (SIP), turning, grinding, portal and high-speed machining (Dörries Scharmann with Droop+Rein and Berthiez), and high-precision machining (Bumotec). "All the companies fit very well into our overall strategy," Fust was pleased to say in an interview with the Swiss journalist Richard Lehner.

Under the new name of the Starrag Group, a group of companies was formed with ten brands that cater to customers in all kinds of sectors. Examples of products manufactured on Starrag Group machines include components for exquisite luxury watches, gigantic drives for wind turbines, high-precision surgical instruments and even the world's largest submarine propellers.

Moving forwards by thinking outside the box

Another aspect that makes Starrag unconventional is the way in which it responds to crises and catastrophes – of which there has certainly been no shortage from the very beginning of the company's 125-year history. For example, the company was able to survive during 1914, when the world went to war, by adapting to the decreased demand for knitting machines: Company founder Henri Levy partially compensated for this drop in demand, by instead focusing on the construction of cigarette vending machines and machines for pitting cherries. In the present day, the company is similarly thinking "outside the box" to react to the consequences of the pandemic and the war between Russia and Ukraine. Among the many examples of this, Starrag CEO Dr Christian Walti was so fascinated by one in particular that he mentioned it in the editorial of the January 2022 edition of the Star customer magazine: "A quite different type of teamwork was called for at Starrag S.A.S. in the French city of Saint-Étienne, who had to assemble a dismantled Berthiez grinding machine in far-off China and commission this on schedule. Due to the pandemic-related travel ban, Starrag China assumed responsibility for the order – while receiving specialist remote support from the grinding experts back in France." The workaround in spite of the strict travel ban was well received by the customer – a global corporation – and resulted in many additional new orders. This team spirit typical of Starrag and the results that it brings would certainly have brought just as much pleasure to company founder Henri Levy as the first gold medal he received!

It's all about the tempo: Starrag products aren't just distinguished by their precision, but also by their productivity. One key example of this is this type HX-151 high-speed milling machine that was developed in the 1990s, which ABB uses to mill turbine blades.

Engineering precisely what you value: True to this claim, the Starrag team develops and builds precisely the machines that its customers need – with all the necessary extras, but without any unnecessary "bells and whistles".

Big developments in the transition **to new energy sources**

When it comes to wind power, Denmark is leading the way: The country now covers 40 per cent of its energy requirements with electricity generated from wind power plants. Specialized Danish companies such as HACO A/S from Jutland have benefited from this situation for years now. Owing to the trend towards larger wind power plants, the company has ordered two gigantic Droop+Rein portal machines from Starrag, in addition to the five vertical turning and boring mills that it already possesses.

An important Danish customer of Starrag orders two Droop+Rein portal machines

"Yes, I'm somewhat uneasy about this large investment, since it far exceeds all the dimensions we've been used to up to now," admits Henning Albrechtsen, the managing director of HACO. He's standing with qualified engineer Hubert Erz – who is the Senior Consultant Sales Renewables at the Swiss Starrag Group – in the factory hall in Bielefeld, where the two are inspecting the construction progress of the next two machine tools. HACO is a key customer of Starrag, since the Danish job shop already possesses five Dörries vertical turning and boring mills.

A large order from the Danes: In Bielefeld, construction is underway on a gantry portal milling machine that will allow for powerful turning, milling and drilling of even very large components made from high-strength welded steel and cast constructions.

With these, HACO was able to develop into a leading contract manufacturer for very large, relatively flat and round components, thanks to the wind power industry in particular.

When the turning diameter grows and grows …

The company has been machining very large components ever since it was founded almost 60 years ago. Nowadays, more than 10,000 tonnes of steel are machined in the Danish municipality of Barrit each year – and the numbers keep going up, since the components required for new offshore wind turbines are only getting bigger and bigger. This also had consequences for the five vertical turning and boring mills, which had their maximum turning diameter expanded to 295 in. (7,500 mm) by Albrechtsen back in 2015. "We modified our machines again to satisfy the demand from one of our customers," explains the managing director. "This led to the housing around the machine being modified and the tool changers being converted, so that we now have a maximum turning diameter on flanges of 354 in (9,000 mm)."

But is this still sufficient for the latest direct drive wind power plants with outputs of up to 16 MW? The components in demand are namely rotor housings with a diameter of 354 in. or 394 in. (9,000 or 10,000 mm); however, even larger components with a diameter of 453 in. (11,500 mm) mm are under discussion. Consequently, businesses who are looking to keep pace with the wind power industry in the long term need to start thinking about "supersizing" – not least due to growing competition from China in this area. In addition, suppliers increasingly do not just have to process new high-strength steels, aluminum alloys and castings, but also a steadily increasing proportion of composite materials.

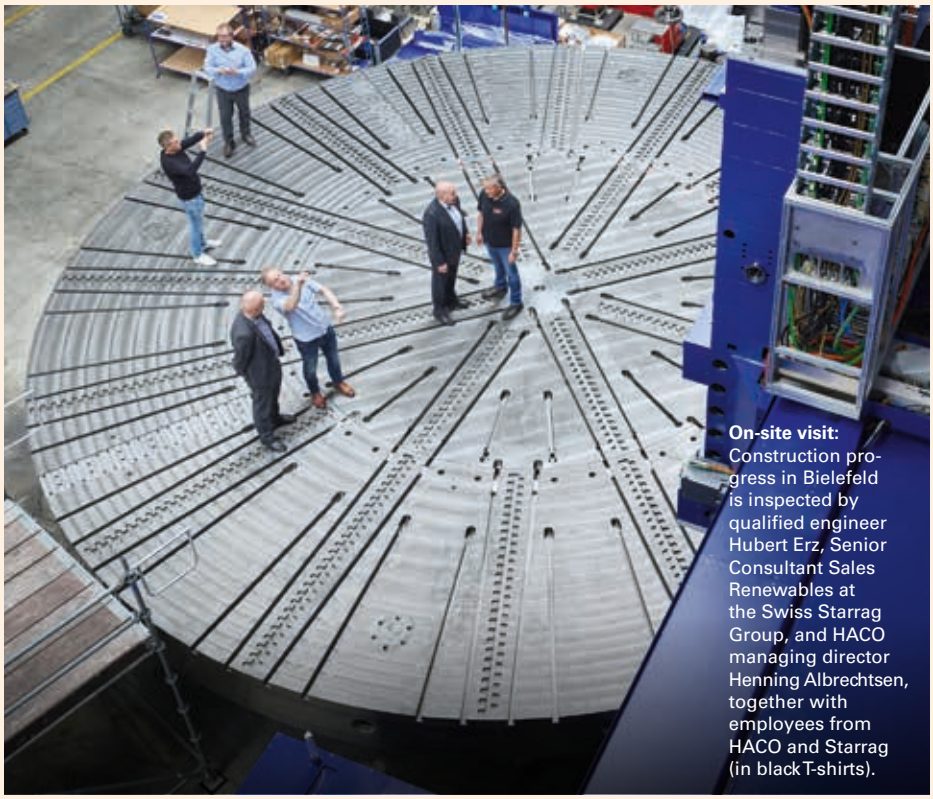
Long-lasting machine technology coupled with personal support

Such challenges can only be tackled with the aid of a machine building company that has expertise in delivering quick solutions – and one that offers the latest, long-lasting machine technology necessary for such solutions, along with close cooperation that includes support in service cases. According to Albrechtsen, HACO has chosen Starrag for this role as the company best satisfies these criteria in combination with price and delivery time. The manager of the Danish

> "Such challenges can only be tackled with the aid of a machine building company that has expertise in delivering quick solutions."
>
> Henning Albrechtsen, HACO-managing director

> "HACO can completely machine all workpieces on both machines, meaning that they can be ideally supplemented and replaced."
>
> Hubert Erz, Senior Consultant Sales Renewables at the Swiss Starrag Group

company also cited the many years of existing collaboration with Hubert Erz as a "significantly decisive factor". Starrag therefore received the order to construct two new portal machines for the complete machining of rotor housings, front and stator sheets, brake discs and other components. In the course of the production process at the Bielefeld site, one machine is being developed as a portal milling machine in a gantry design, followed by the construction of the second as a portal turning machine with a third linear axes in the table.



On-site visit: Construction progress in Bielefeld is inspected by qualified engineer Hubert Erz, Senior Consultant Sales Renewables at the Swiss Starrag Group, and HACO managing director Henning Albrechtsen, together with employees from HACO and Starrag (in black T-shirts).

Complete machining in a new dimension

Development is already underway on the gantry portal milling machine, which will allow for powerful turning, milling and drilling of even very large components made from high-strength welded steel and cast constructions through the interaction of the 134 hp (100 kW) milling head with a 2 x 149 hp (111 kW) master-slave main drive. The machine has a clearance of 496 in. (12,600 mm) in between the stands, the gantry axes travels over a distance of 551 in. (14,000 mm), and the ram allows a maximum stroke of 138 in. (3,500 mm).

The dimensions are visibly impressive to Albrechtsen and his employees Christian Hermansen and Tage Friis during their inspection of the first machine, which almost touches the ceiling of the Bielefeld factory hall at its height of 551 in. (14,000 mm). Once it is finally complete, the new creation will weigh around 500 tonnes – as much as 50 bull elephants. It's not just the size and machine type that are new to HACO, however, but also the location in which the machine is to be deployed. For years now, the company has been working closely together with Valmont SM A/S, one of the world's leading suppliers of steel components for the wind power industry. Up to now, this company was delivering welded blanks that were transported via heavy goods transport to the HACO plant in Barrit for mechanical finishing all the way from the town of Rødekro, which lies 100 kilometers to the south.

Sustainable logistics for sustainable products

The multi-year customer contract with a renowned manufacturer of offshore wind

Space for super-size components: A look under the rotary table shows the dimensions of the portal milling machine, which will be able to machine rotor housings with a diameter of more than eleven meters following its final stage of construction.

Robust mobilization: Proven drive technology (pictured: fork type milling head) ensures very precise and highly productive machining.

power plants now required a rethink. HACO and Valmont consequently decided on a more sustainable form of collaboration. The family-run company from Jutland is therefore establishing a subsidiary plant for the two portal machines near Valmont's headquarters in Rødekro, where the gigantic components for their shared customer can be manufactured without the aforementioned usual transport of heavy goods over land. Rødekro's proximity to the sea is also a point in its favour. "From here, even gigantic, extremely heavy rotor housings can be transported via ship in an environmentally friendly manner for assembly at the manufacturer of the offshore wind power plants, whose plant is also located near to the coast," explains Erz, who is supervising the project for Starrag. "This way, we avoid having to use many additional kilometers of heavy goods transports, which would not only obstruct road traffic, but also contribute to environmental pollution."

Machine no. 1: Deployment in November 2023

The new form of sustainable coproduction will begin in November 2023 with the commissioning of machine no. 1 in Rødekro. At the same time, machine no. 2 – a portal turning machine with a third linear axes and adjustable table – will be constructed in Bielefeld. It has similar dimensions to the portal milling machine, but comes with an additional feature that takes into account the ever-expanding dimensions in wind power plant construction: By adjusting the table, the turning diameter can be expanded from 512 to 591 in. (13,000 to 15,000 mm) as necessary. The portal turning machine is equipped with a 2 × 182 hp (136 kW) master-slave main drive and a 107 hp (80 kW) milling head, and is predominantly designed for turning processes. Erz notes: "HACO can independently completely machine all workpieces on both machines, meaning that they can be ideally supplemented and replaced."

Visibly impressed by the visit to Bielefeld, it's not just the managing director of HACO who is looking forward to the new site in the south of Denmark and the deployment of the super-sized pair of machines. Albrechtsen adds: "Our 86-year-old father hopes to experience the commissioning of the two new machines in the new hall for himself."

A key factor in the decision was the strong partner relationship, which has been contractually approved from Metalex's side.

True greatness is T-shaped

Advanced technology machining company Metalex Manufacturing Inc. expands its Center for Advanced Large Manufacturing with Droop+Rein T portal-type machining centers from Starrag.

The long-term partnership between US manufacturer Metalex Manufacturing Inc. and the Starrag Group has revealed a lot in common: Both are specialists in extremely large components made from aluminum, stainless steel and titanium for very challenging applications. Now the Ohio-based job shop plans to grow even more, adding a fourth Starrag machine to the mix. So what are Metalex's plans for its new Droop+Rein T six-axis portal-type machining center?

"Good things achieved and excellent things cannot be acquired without great effort and work." This advice from the poet Hans Jakob Christoffel von Grimmelshausen around 350 years ago couldn't be a better fit for Metalex Manufacturing Inc. from Cincinnati, Ohio, and the Bielefeld plant of the Starrag Group. This phase of their partnership may have been put on pause for many reasons, the pandemic being one of them, but now the Droop+Rein T 60 80 DT TT60 HR100 C portal-type machining center is coming into operation at the Center for Advanced Large Manufacturing, a bespoke extension of their main plant in the form of an enormous building.

It's the biggest portal-type machining center in the Droop+Rein T product line to date: thanks to their optimal rigid construction and hydrostatic operating concept, these machines are perfectly suited to high-precision machining of extremely large workpieces with complex geometry in settings that require adherence to extremely tight tolerances. Heiko Quack, Starrag's Bielefeld-based sales director for large projects, states that these machines "produce very flexible, efficient and precise workpieces using various materials on five axes."

Acceptance only after intensive benchmarking

Starrag offered exactly what its American customer was looking for: Metalex was on the hunt for a machine that would satisfy not only its current production needs, but also the demands of the future, too. These are the challenges Metalex, along with its machinery suppliers, must face as a large manufacturer of top quality, complex components. Although the company already had three Starrag machine-tools at its disposal, it decided on a Droop+Rein T-product line portal-type machining center after an intensive benchmarking process. A key factor in the decision was the strong partnership, which has been contractually approved from Metalex's side.

The machining center has a Z-axis slide feed milling unit with integrated C-axis and a wide range of milling heads. It includes two rotary tables and turning tool holders from the Dörries product range, which have been used in a Starrag machine for years and have proven to Metalex that they are reliable, productive components.

This is XXL at its finest, as a glance at the unusual dimensions of the work area shows (X: 748 in. (19,000 mm); Y: 354 in. (9,000 mm); Z: 118 in. (3.000 mm)). Here, even very large workpieces can be machined on a single setting thanks to the huge amount of space available. Extremely flexible five-axis machining is made possible by the two continuous universal fork type milling heads. They are perfect for heavy machining with up to 1,770 ft-lb (2,400 Nm) of milling torque. But it can also be used with motorized milling spindles at high speeds, which can be changed out automatically with milling spindle replacement. For even more flexible, universal work, Metalex ordered a 217 in. (5,500 mm) continuous mobile crossbar as its 6th axis (W).

Two tables for less non-productive time

The real highlight of this XXL machine is, according to sales director Heiko Quack, its specially designed table configuration with two large tables (236 in. (6,000 mm) × 315 in. (8,000 mm): "The operating personnel can work on them completely separate: One table can be used for preliminary set-up or inspection outside the work area while the other is being used for machining."

Extra-long workpieces can be machined in a coupled tandem formation, which extends the tables to 709 in. (18,000 mm). Each table also has an integrated rotary table (diameter: 236 in. (6,000 mm)) which, thanks to the 149 hp (111 kW) main drive, also enables rotary machining of components weighing up to 200 tons. But the rotary tables can also be used as a C-axis for precision positioning when milling and drilling. Heiko Quack is convinced this machine is unique in its size, configuration and multifunctionality.

Currently, the system allows the use of tools with CAT 60, CAT 50, Capto-C8, HSK 100 or HSK 63 holders, which supply the respective machining head with the tool as and when required.

> "We are already seeing very good utilization of the new machinery!"
>
> Kevin Kummerle, CEO Metalex

Speedy aluminum milling with 18,000 rpm

The eleven machining heads Metalex ordered for its machine, create universal functionality. However, the day-to-day activities in Ohio prove that even that isn't enough for a truly flexible manufacturer. While the machine was still being commissioned, a requirement arose for milling large aluminum rings for an aerospace customer. So, Starrag and Metalex put their heads together to look into the possibilities for high-speed machining and the highest productivity that can be achieved. The result: After successful

testing, Starrag delivered and integrated a new motorized spindle (18,000 rpm) for the five-axis fork type milling head in time for production to start. "This example shows that a manufacturer, who rarely has the option to define exact specifications, can react flexibly to new requirements by using the right machine concept and the close collaboration with the machine supplier," emphasizes the sales director. "The extra spindle allows the manufacturer to increase productivity by a huge amount when manufacturing this ring."

But what about productivity when a machine with a head changing system and twelve machining heads suddenly has one or more machining heads added into the mix – would that lead to a rise in non-productive time? Starrag had this scenario in mind when developing this system. According to Heiko Quack, "the machining center has an electronic system for managing machining heads. I could, for example, eject an XY angular milling head in order to swap it for a fork type milling head. So Metalex can keep 30 machining heads on hand and always bring in the ones needed for a job." And it's paying off, because there are discussions in Ohio about adding head 13 and 14.

> The robot tool change system has been rolled out at lightning speed.

Robots ensure fast tool change

The robot tool change system has been rolled out at lightning speed: Large manufacturers often need space not only for a lot of tools but also for a huge variety of tool systems. Currently, the system allows the use of tools with CAT 60, CAT 50, Capto-C8, HSK 100 or HSK 63 holders, which supply the respective machining head with the tools as and when required. Understandably, for a project of this level, which represents the largest investment in the company's history, there is always going to be skepticism: will the expensive investment in the Center for Advanced Large Manufacturing – for which Metalex has constructed a state of the art production building with extremely low-vibration foundations weighing 7,000 tons – pay off? The investment, which cost several million US dollars, seems to have been worth it so far. At least, that's what Heiko Quack was told when the machinery was put into action in the US: "We are already seeing very good utilization of the new machinery!" Metalex CEO Kevin Kummerle, who is already thinking about making further investments, has a similar view of things.

An equal partnership

Interview with Heiko Quack

XXL projects are nothing new for Starrag's Bielefeld-based sales director for large projects, Heiko Quack. But one order pushed the boundaries in every direction: The customer, Metalex, not only had one of the largest portal-type machining centers in the Droop+Rein T product line built to date, but also contractually agreed to work together as partners on an equal footing.

Mr. Quack, what sets this project apart? Is it the size, the multifunctionality, the machining performance required from the Droop+Rein T portal-type machining center?
Heiko Quack: Everything, because you don't build a six-axis machine in these dimensions on a daily basis, with these milling and turning capabilities, with eleven machining heads, five tool systems and over 400 tools. Another special fact about this project is that Metalex wasn't just looking for a machinery supplier.

They wanted a partner who could work with them to jointly develop and execute this project. He emphasized that this is also stated in the contract. Metalex expects us to work on this project together, to exchange ideas, to define a common goal and work towards it together, as partners. That's the only way such an enormous project can be brought to life. And it wasn't just the project management on both sides that was carried out as a partnership. The whole team of Metalex and Starrag employees working on the project did an incredible job! Of course, there were a few misunderstandings and differences of opinion over the almost-four-year timespan of the project. But neither side lost sight of their goal and always knew how to come up with a solution.

What impact had the coronavirus pandemic on the project?
Heiko Quack: It's had a huge impact. We had to work together on a major project during the pandemic – with everything that entailed. For a while, Europeans weren't allowed to travel to the US. However, our Engineers were given an exemption by the US government because Metalex works on projects in the national interest. But the main reason for the project's success was the team spirit shown by the two different companies, both of which are used to work in a practical and solution-oriented manner and having a hands-on mentality.

What was the feedback like after four years of intensive collaboration in Cincinnati?
Heiko Quack: First, the intensive project management made a big impression. Second, I believe the high-quality, clean work was seen in a positive light over there. It also definitely impressed the customer when we changed certain details after we realized we could do things even better.

And what does the team on the shop floor think?
Heiko Quack: This topic of partnership comes up again and again. The shop floor team was able to get involved in the development from day one: Now they know the most efficient way to program and operate the machinery to suit their needs. We have implemented many of the users' ideas in terms of software

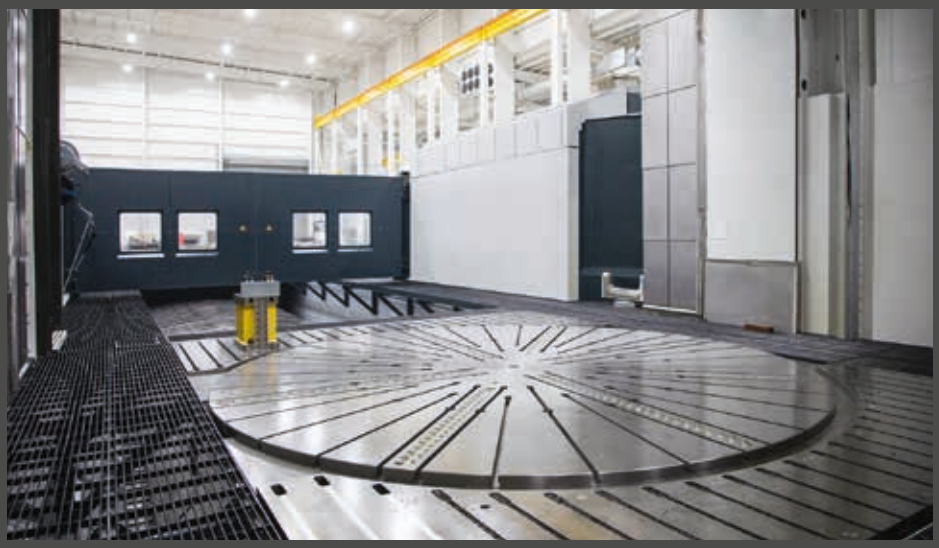
and application technique with regards to axis transformation. Operators are now able to use all technologies quickly, efficiently and productively. Everything we have learned will also be useful for future projects. That's another example of the advantages of working on projects in partnership with others.

How did the management react to the new acquisition?

Heiko Quack: I sensed there was some skepticism, with executives thinking, "Was this huge investment really the right thing to do?" But they didn't stay skeptical for long, because the machinery has proven its worth already. The first orders – large aluminum rings for the aerospace industry – came in before they even started actively marketing it.

Does this mean they're interested in more XXL machines?

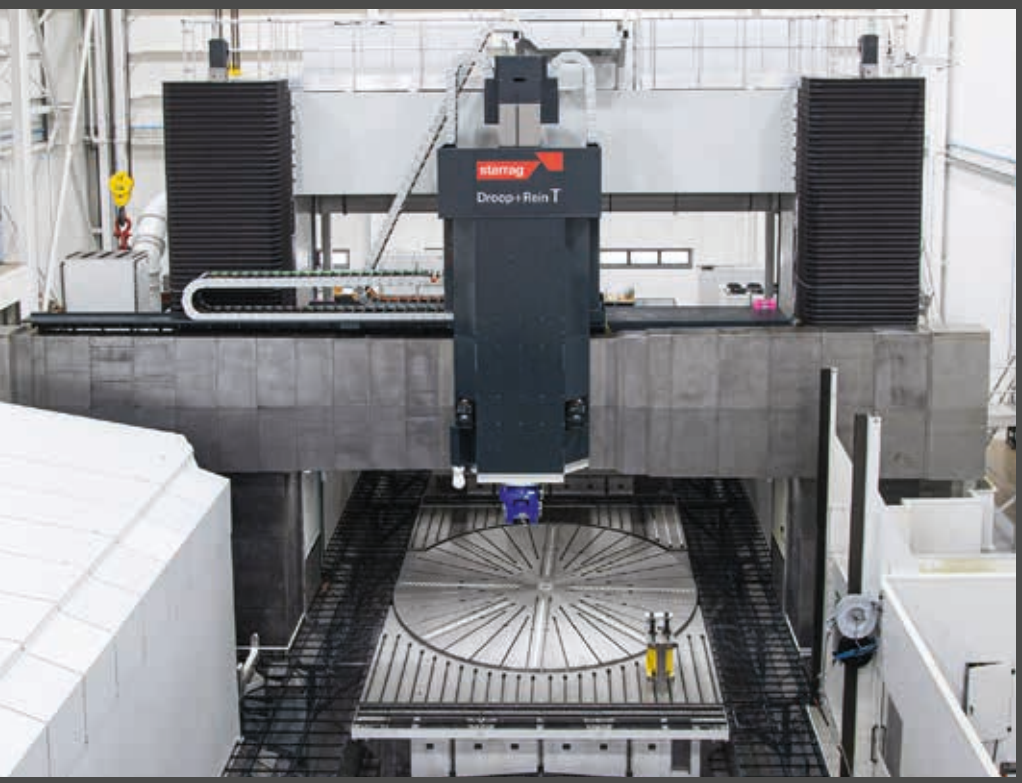
Heiko Quack: Metalex wants to remain at the forefront of technology and is continuing to invest in production technology as a result. They definitely have enough space in their production buildings for more large machinery in any case.



Heiko Quack: Everything, because you don't build a six-axis machine in these dimensions on a daily basis, with these milling and turning capabilities, with eleven machining heads, five tool systems and over 400 tools.

Metalex is planning a Smart Factory. How is Starrag supporting its customer to do this?

We have implemented several digital solutions on our machinery. First, we have provided an interface to enable Metalex to connect the machinery to its production monitoring system. Data from the machine is constantly being collected and processed via this interface. For example, the runtimes of NC programs can be monitored and evaluated, or tool costs can be clearly assigned to the individual machining operations. We also took the digital fingerprint of the machine after it was put into operation. We document the condition of the machinery upon delivery using various measurements and analyses. By repeating these automatically and digitally evaluating this fingerprint, we can enable Metalex to carry out preventive maintenance on its new machinery and ultimately anticipate maintenance needs throughout its lifespan.



"It also definitely impressed the customer when we changed certain details after we realized we could do things even better."

Heiko Quack,
Starrag sales director
for large projects

"Only by carrying out complete machining in a single set-up can we satisfy the requirements with regard to precision, surface quality and cost effectiveness."

Paul Oberholzer,
Operations manager
and member of the
board of management

Plenty of chips – perfect surfaces

We are living in an increasingly digitalized world. Microchips provide the basis for this digitalization – and they themselves are becoming increasingly more powerful. The main manufacturing processes for these semiconductors take place in high-vacuum systems, and Max Schilling AG supplies housing components made from special aluminum for the chambers of these systems. Due to the component size and in order to satisfy the enormous machining rate while adhering to high quality requirements, the milling specialists at Max Schilling AG rely on an STC 800 five-axis machining center from Starrag.

Five-axis machining center achieves a fine balance between high-performance rough machining and extremely fine finishing.

Microchips are an integral part of computers and smartphones, but can also be found in many other electronic devices, machines and systems. The extent of the dependency that we have on these small electronic components was made clear during the chip shortage of 2021, when many machines and systems were not able to be manufactured to completion. In the automotive industry, production lines sometimes came to a standstill. Even electronic household appliances were occasionally unavailable for delivery.

The growing trend towards digitalization has increased the demand for these semiconductors – which themselves are becoming increasingly more powerful – even further. It's not just production volumes that are increasing: The technology being used to produce them is also becoming more and more sophisticated. To put things into perspective: Current microchips contain structures that have a magnitude of a few nanometers. (For comparison: A human hair measures around 0.0012 in. (30,000 nanometers) in diameter.)These nanostructures are produced on extremely thin silicon wafers using vapour deposition, exposure and etching methods – in high-vacuum or even ultra-high-vacuum chambers that adhere to maximum cleanliness requirements.

Max Schilling: Assembly supplier for vacuum chambers

Andreas Tinner, sales manager and member of the board of management at Max Schilling AG, explains: "The essential expertise in the production of such semiconductors now lies in the process and no longer in the production system. For a good ten years now, microchip manufacturers have been purchasing the system technology from OEMs, who in turn obtain individual components and assemblies from supplier companies like us."

Max Schilling AG is a machining service provider that specializes in optimum-quality precision parts. Since its founding in 1985, the company has developed from a pure parts supplier into a system integrator that also assembles, checks and supplies assemblies ready for installation. "Important customers come from the packaging and automotive industries," explains Andreas Tinner. "In around the last ten years, we have succeeded in establishing another large pillar in the form of the semiconductor industry. We are commissioned by OEMs to manufacture various components and assemblies that are installed in vacuum systems."

At Max Schilling AG, all signs point to growth. Since its involvement in the semiconductor industry, the number of employees has risen from 20 to 35. As the previous site in the Swiss municipality of Bilten did not allow any opportunities for growth, at the beginning of 2022, the company relocated its headquarters to Mollis in the canton of Glarus, 6.2 miles (10 kilometers) away. Tinner and his colleagues are full of optimism for the future: "Over the next three years, the demand for semiconductors is predicted to be extreme. We hope that we will also be able to take a slice of the pie."

Five-axis simultaneous machining is mandatory

Over the years, Max Schilling has expanded its machine fleet to include five-axis machining centers, among other units. "When it comes to sophisticated aluminum structural components, five-axis simultaneous machining is mandatory," explains Paul Oberholzer, another member of the board of management who holds the post of operations manager. "Only by carrying out complete machining in a single set-up can we satisfy

"So far, our investment has paid off. The chamber production is proceeding very successfully. With a single set-up, the housings come out of the machine in perfect condition after around ten hours." Sales manager Andreas Tinner (left).

the requirements with regard to precision, surface quality and cost effectiveness."

The success of this approach to date has been confirmed by orders coming in from system manufacturers not just in the local region, but also from the USA. The inquiry regarding the supply of a certain large housing for high-vacuum chambers was one that was regarded as particularly interesting by the managers at Max Schilling. "Our most important customer in this segment approached us saying that they wanted to relocate the manufacturing of this housing from other locations such as Malaysia back to Switzerland," reports sales manager Tinner. "We hesitated only briefly, since we did not yet have a suitable machine that would be able to machine the large parts with over 35 cubic foot (1 cubic meter) of volume without readjusting the set-up."

Powerful in both rough machining and finishing

The requirements for a five-axis machining center of this kind are high. A fundamental requirement is to have a correspondingly large working area or collision circle. The machine must then provide powerful rough machining, since the degree of machining for the housings – which are made from a special aluminum alloy – is over 60%. Ultimately, though, it all comes down to the finishing. High-quality surfaces are required for the seal seats and in the interior in particular. "The seal is the most important thing about these housings," explains Andreas Tinner. "Otherwise, it wouldn't be possible to generate a high vacuum. And if the surfaces in the interior have a high level of roughness or even grooves, it becomes immensely more difficult to create a vacuum. In this case, it can take a number of hours for the pump to generate the high vacuum required."

Hurdles such as excessively high procurement costs and long delivery times were initially encountered in the search for a suitable machine. Upon a visit to the Starrag plant in Rorschacherberg, however, Paul Oberholzer's machining team finally found what they were looking for. The site is home to the Center of Production Excellence (CPE), where Starrag tests and optimizes sophisticated new machining processes – and it was here that the team was able to see the STC 800 five-axis machining center in action for themselves.

Starrag developed the STC series for the economic machining of very sophisticated structural components, multi-blades and casings with long cycle times. These machining centers stand out on account of their very good stability and excellent dynamic properties, as well as thanks to the tried-and-tested swivel head that allows for simultaneous five-axis machining. With a maximum workpiece size of 55 in. (1,400 mm) in diameter and height, as well as a permissible workpiece weight of up to 4,409 lb. (2,000 kg), the Starrag STC 800 satisfies other fundamental prerequisites.

First-class technological support

The concept of the STC 800 won over operations manager Oberholzer and the other managers at the company from the very beginning: "We were certain that the stability of the machine in combination with the right tools would guarantee perfect surfaces and was ideally suited to our large parts made of aluminum – which has proven true in our everyday operations today."

The other general conditions also made the machine a perfect fit. In the CPE, the machinists from Max Schilling AG were able to test and optimize the STC 800 with their own parts prior to the purchase. Paul Oberholzer was full of praise for this: "The technological support was really

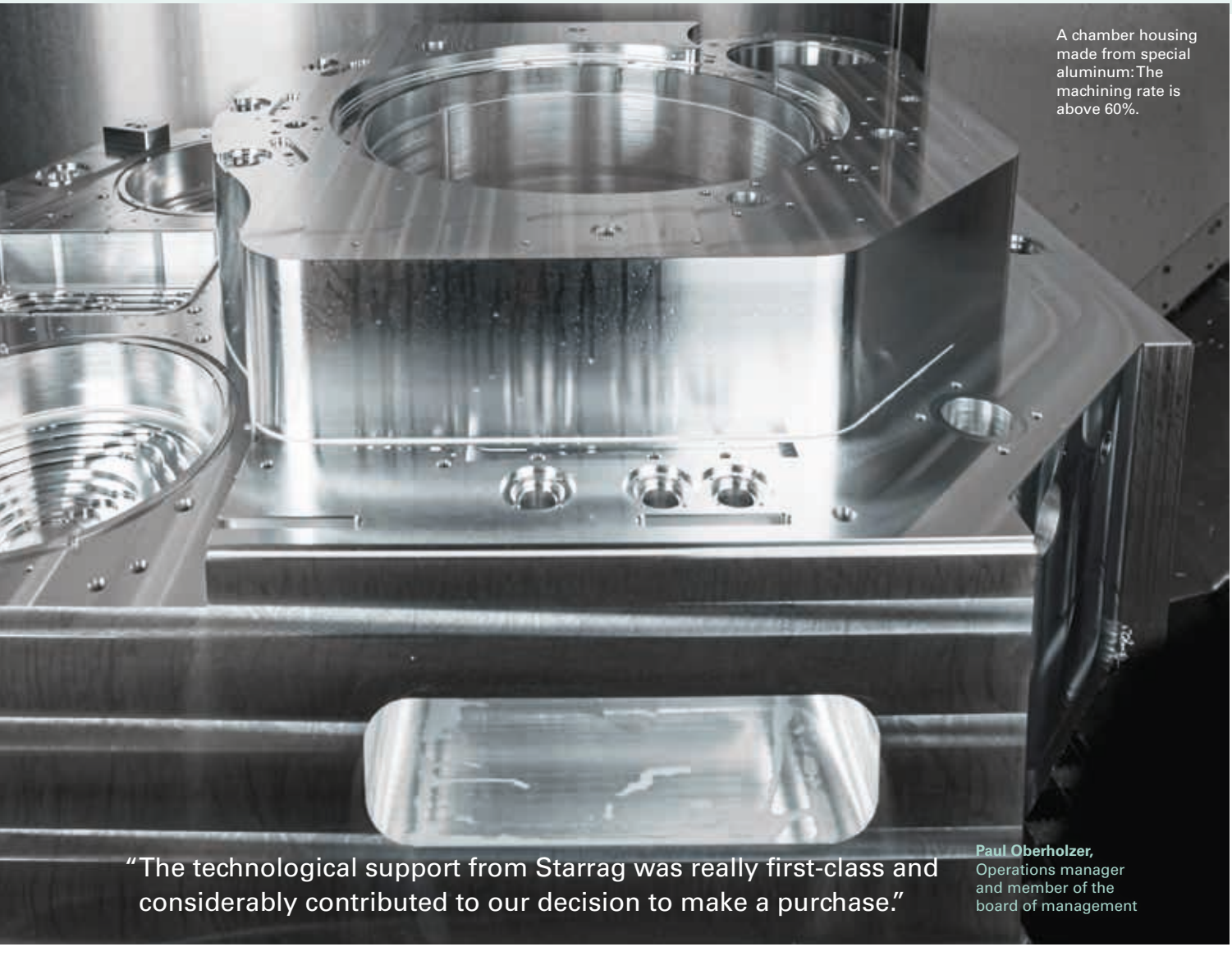
first-class and considerably contributed to our decision to make a purchase. Starrag has an enormous amount of expertise when it comes to machining large structural components. The machine operators and technologists know exactly which screws need to be turned to resolve certain machining problems, for example to avoid vibrations and to improve the result. We learnt plenty from this."

Ultimately, the price was also right, as Andreas Tinner explains: "A Starrag machine is no bargain, we were aware of that. And yet, as a medium-sized company, we also weren't able to pay any price. In this respect, it was fortunate for us that we were able to purchase the machine at a somewhat reduced rate following its deployment as a demonstration and test machine – of course, after it had been completely overhauled and restored to a practically as-good-as-new condition."

Ideal conditions for the vacuum chamber production

The machine was also available to be delivered on the desired date. Since the middle of 2021, the Starrag STC 800 has been running predominantly in a two-shift operation at Max Schilling's new production hall in Mollis. The main components that are manufactured are housing components for vacuum handling chambers and for process chambers. PCD tools produce surfaces that fulfil all requirements. The parts are then pre-cleaned and rinsed several times. The assembly then takes place in a Class 7 clean room. In order to be able to supply the fully assembled assembly, Max Schilling has also invested in a clean room of this kind.

"So far, our investment has paid off," reports Andreas Tinner with satisfaction. "The chamber production is proceeding very successfully. With a single set-up, the housings come out of the machine in perfect condition after around ten hours. We still haven't had any complaints from our customers." Instead, what they have received are new requests for housings in even larger dimensions. "We actually hadn't expected such requests to come in so quickly. However, we have already reserved space in our new hall, which provides a suitable foundation to be equipped for further investment. And we'll certainly be discussing this with Starrag."



A chamber housing made from special aluminum: The machining rate is above 60%.

"The technological support from Starrag was really first-class and considerably contributed to our decision to make a purchase."

Paul Oberholzer, Operations manager and member of the board of management

Starrag in Vuadens: Behind the scenes of a world first

The new Bumotec 191^{neo} multi-functional machining center, the "precision solution with 12 faces"

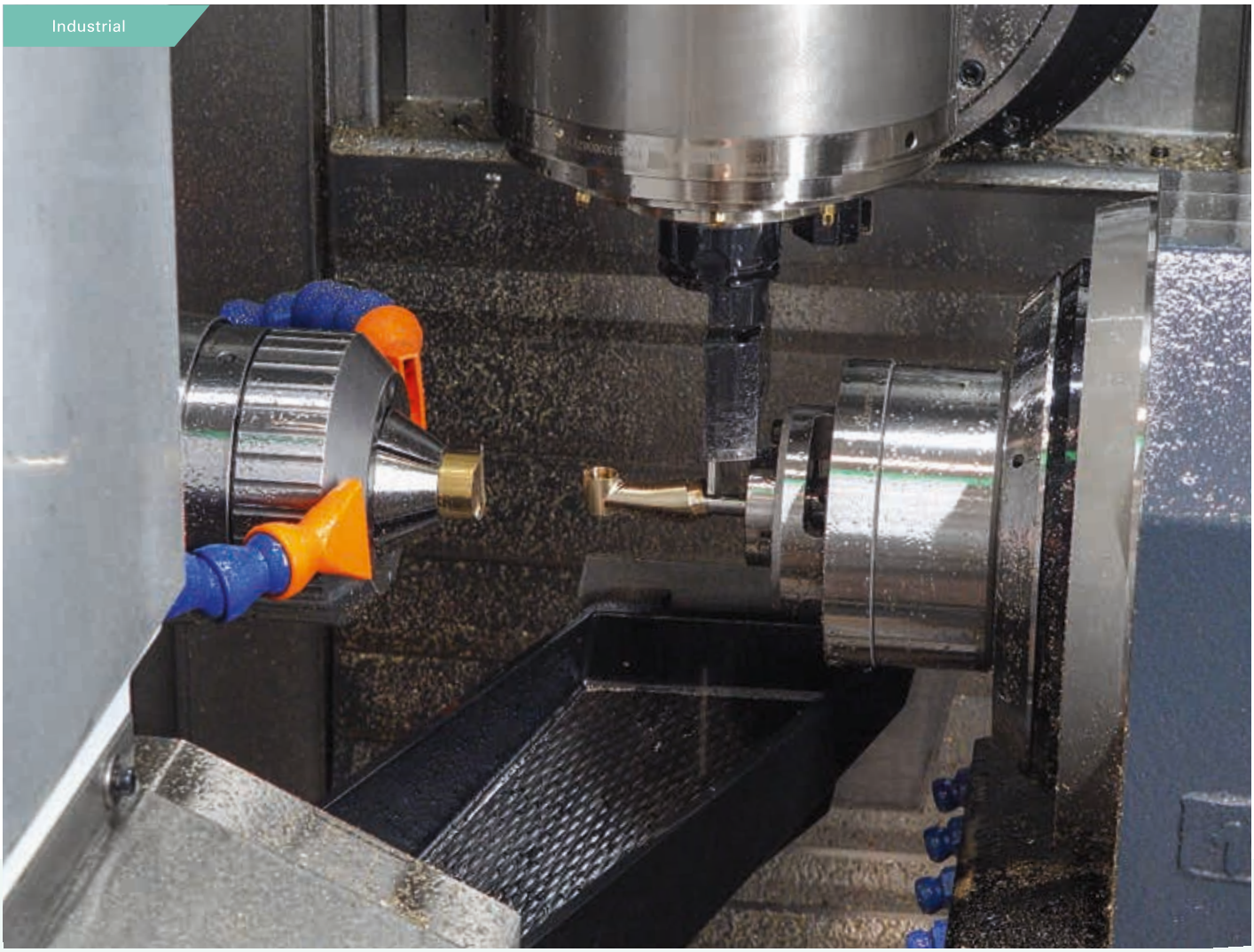
The aspect of the machining center that impressed Del West Europe SA, based in Roche, Switzerland, was the wide variety of many different materials that it could machine – and not just for the watch industry.

Before the revolutionary Bumotec 191^{neo} machining center was brought onto the market, it was put through its paces under real conditions. Del West volunteered to do this, bringing benefits to the entire sector. What role did Del West play "behind the scenes"? In spring 2022, Starrag in Vuadens prepared a world first, the market launch of its new Bumotec 191^{neo} multifunctional machining center.

Man and machine for Industry 4.0

What better way of optimizing this prime example of ingenious machining technology for the requirements of the market ahead of the launch date than by installing it at one of its user's premises? "Initially, we simply felt honoured and then we were eager to help. It was very motivating for our teams, who played their part in developing a first-rate machine," says Olivier Conne, Managing Director of Del West Europe. He considered which range of applications would be the most representative for this testing phase. "It was a matter of considering the different machining types, particularly when milling, and also with respect to unloading and even the behaviour of workpieces during high-speed machining," he explains.

Given that the two companies are a short distance from each other, the machine building company was able to gradually and continuously perfect the HMI (human-machine interface) over the course of frequent on-site meetings. This ensured that the operating system was as intuitive as possible with its use of simple, clear language and provided information via images and graphics that are easier to understand and more accessible. Moreover, the companies gained a more in-depth command of the data being processed and transmitted. After all, such data has already become a well-established part of Industry 4.0, enabling autonomous operation around the clock and machines designed to receive instructions remotely.



A conveyor for all chip types, suitable for the wide range of materials processed by Del West Europe.

The new challenges and the need to measure up to the competition proved to be a "fertile breeding ground".

"No one needs to struggle with annoying tree structures any more," sums up Jérôme Zbinden, responsible for research and development at Starrag in Vuadens. Olivier Conne adds, "in addition to the basic functions, we were able to go through all of the details relevant to the very fine settings to further improve the machines' user-friendliness and efficiency." This resulted in a better understanding of the machine – both on the part of those who only occasionally deal with it, such as maintenance personnel, and those who need to coordinate the volume of orders with the machine workload from their management cockpit.

Choosing the optimal chip conveyor

The aspect of the machining center that impressed Del West Europe SA, based in Roche, Switzerland, was the wide variety of many different materials that it could machine – and not just for the watch industry. This leading manufacturer of high-end precision products is also very active in other fields of microtechnology. "It's true that in addition to steels, we also machine a good dozen alloys, for example, for our customers in Formula One. We also use titanium and aluminum, which are rarely seen in the watch industry – not to mention the other materials," confirms Olivier Conne. However, when chips are removed, it all comes down to taking account of the specific

The human-machine interface (HMI) – now even more intuitive with more images and graphics. Incredibly user-friendly.

Thanks to the cooperation of Del West Europe SA, Starrag Vuadens was able to optimize the Bumotec 191neo not only for this customer, but the entire market.

behaviour of each material. For precious metals, they not only need to be filtered out of the machining area, a recovery rate of over 99% is also required. Since this wide range of capabilities is in demand, Starrag designed the chip conveyor to be suitable for all chip types, whether for spiral chips or microelements to be filtered. At the same time, any risk of the lines clogging the oil cooler or any obstruction of the cycles in a closed circuit must be avoided.

Tested by the user

Being able to install such a revolutionary machining center as the 191neo with a customer before its market launch is a real luxury. Thanks to the cooperation of Del West Europe SA, Starrag Vuadens was able to optimize the Bumotec 191neo not only for this customer, but the entire market. The new challenges and the need to measure up to the competition proved to be a "fertile breeding ground". This preliminary testing under real conditions ensured that optimal use is made of the new machining center in manufacturing. This was the "battle testing" phase for the machine technology, says Olivier Conne in a tongue-in-cheek military analogy. Starrag will continue to keep an open ear to Del West, particularly with respect to future developments of the Bumotec 191neo.

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