

Heavy-duty cutting in a single apartment

Heckert H65: How Starrag meets customer requirements

Starrag STC 800 X provides diverse growth opportunities for Schaller Group

Expansion expected beyond aerospace, military and automotive

Partnership on equal footing

Double premiere enables a premium job shop to enter new markets

Large-scale potential

Berhalter invests in a five-axis large-scale machining centre to expand its range of services



The right DNA for
agricultural machinery

Content



06 Dr Markus Richter,
Starrag Chemnitz



08 Five years Tech Center
at Immendingen



12

Starrag STC 800 X provides
diverse growth opportunities
for Schaller Group

05 Editorial

By Dr Christian Walti

CURRENT NEWS

06 Heavy-duty cutting in a single apartment

Heckert H65: How Starrag meets customer requirements

08 Five successful years at the heart of medical technology

On an area of just under 600 m² at its Tech Center,
Starrag presents their exclusive technology:
The Bumotec top sellers s181 and s191H

AEROSPACE

12 Starrag STC 800 X provides diverse growth opportunities for Schaller Group

Expansion expected beyond aerospace,
military and automotive

LEGAL NOTICE

**Star – The Starrag Group
magazine**

Publisher:

Starrag Group Holding AG
Seebleichstrasse 61
9404 Rorschacherberg
Switzerland

Tel.: +41 71 858 81 11

Mail: info@starrag.com

Managing Director:

Dr Christian Walti

Editorial staff:

Franziska Graßhoff, Eva Hülser,
Sabine Kerstan, Christian Queens,
Angela Richter, Michael Schedler,
Elena Schmidt-Schmiedebach,
Ralf Schneider, Stéphane Violante

Picture credits:

© Photographs and illustrations:
Starrag Group 2021

© Page 22–27: Ralf Baumgarten

Page 2, 12–13: Greg Grenier,
Speedboat

Design:

Gastdesign.de

Printing:

Druckhaus Süd, Cologne

Reprinting:

All rights reserved. Contents
may not be copied without
written confirmation.

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

www.starrag.com



22

Droop+Rein FOGS
NEO and HD



28

Berhalter invests in a five-axis
large-scale machining centre

TRANSPORTATION

16 The right DNA for agricultural machinery

Heckert machining centres helping to get food problems under control thanks to tailor-made production technology

INDUSTRIAL

22 Partnership on equal footing

Droop+Rein FOGS NEO and HD: Double premiere enables a premium job shop to enter new markets

28 Large-scale potential

Berhalter invests in a five-axis large-scale machining centre to expand its range of services

32 Business boost for NASA Spinoff

Amorphology is a leader in applying advanced materials and manufacturing technologies toward improving non-lubricated gears for robotics and industrial applications using amorphous metals

starrag

Engineering precisely what you value

—
Dörries

For those who
want it all.



20%

shorter machining time

due to milling, turning and
drilling operations in one
clamping position

www.starrag.com



Dr Christian Walti
CEO of Starrag Group

Dear reader,

“Win the smart future together.” The 17th China International Machine Tool Show (CIMT) is using these optimistic words to promote the world’s first major machine tool show of the year in Beijing, where Starrag will also be presenting its products and services.

“Together” is also the message of the latest issue of our magazine Star, which will also be published in Chinese at CIMT in April 2021. For Starrag, “together” means: First of all, precisely determining customer requirements, then developing tailor-made solutions. A prime example of this is the new Heckert H65 four-axis machining centre, which meets all customer requirements from maximum dynamic to maximum productivity with the smallest possible footprint.

The cooperation with German premium job shop CONCAD GmbH, based in Walldürn, is characterised by an eye-to-eye partnership: Managing Director Klaus Schwab suggested that Starrag combines the two machine types Droop+Rein FOGS and TF into a completely new machine concept. The Starrag plant in Bielefeld (Germany) met the customer’s requirements with a completely new high-performance, precision-cutting high-gantry machine. Satisfied, the regular Starrag customer immediately ordered a second equally new, but smaller Droop+Rein machine tool.

Often, however, special industry requirements also play a role: In the article “The right DNA for agricultural machinery”, you will learn how Heckert machining centres safely and efficiently process the heavy, large and robust XXL components for tractors, ploughs or fertiliser spreaders. Starrag has been looking at another target group in Immendingen, Germany over the past five years: Situated near Tuttlingen, the “world’s centre for medical technology”, the Tech Center is demonstrating new manufacturing solutions for medical technology companies with presentations on high-precision Bumotec turning milling centres.

Sometimes, however, there are customers who work for several industries at once. One of these is the family-owned Schaller Group, which produces large, heavy components for aerospace, automotive and medical technology industries as well as the military. Regular American customers place extremely high demands on the machining of highly complex aluminium workpieces, a task now undertaken by a Starrag STC 800 X five-axis machining centre. It’s not just technology that counts to Schaller, but also a sense of coming together. As such, Chief Technologist Justin Schaller does not feel like a Starrag customer, but rather a Starrag partner.

You will feel this special spirit of “coming together” in all the Star stories: Be it with the project for NASA spin-off company Amorphology, which received a Bumotec s191H machining centre plus a custom-designed cutting tool for the production of microgears, or Swiss Berhalter AG, which is now entering a new business area with a five-axis large-scale Starrag STC 1250 machining centre – a recipe for success that shows “a living partnership with our customers”.

All that is left to say is I hope you enjoy reading the Star 01-2021 issue and enjoy our “coming together”.

Christian Walti



Heavy-duty cutting in a single apartment

Starrag's claim of "Engineering precisely what you value" is more than just an advertising slogan: In order to ensure consistent compliance with it, Starrag held thorough discussions with potential customers looking for a compact machining centre for heavy-duty cutting.

In these detailed conversations,

Starrag identified the nine most important properties, ranging from the highest level of dynamics to maximum efficiency and productivity. Starrag has put the customer's wishes into effect with the new Heckert H65 four-axis horizontal machining centre. It fits into a small single apartment and holds up to 1.5 tonnes of heavy workpieces on the 630 pallet for machining on the spindle.

But how does a manufacturer improve products that are already well received on the market? The answer is provided by Alexander Attenberger, Chief Sales Officer (CSO) of Starrag: "We are able to precisely filter the things that really hurt our customers. This way, we are able to understand exactly what the

customer needs at that moment." By implementing this strategy for success, Starrag examined what customers want from a compact machining centre suitable for heavy-duty cutting. One of the most important factors is a low space requirement, because hall space is valuable.

The aim was to develop a machining centre that would fulfill all requirements with the lowest possible installation space – while simultaneously increasing accessibility and improving serviceability. The result is outstanding: The new Heckert H65 fits in a small single apartment and works significantly faster.

"For customers who need more dynamic performance and higher speeds, we offer the right solution with the Heckert H60,"



Designed to the nines: This is how Starrag fulfills its customers' needs

1. **Maximum dynamics:**

Thanks to the column optimised for dynamic machining, the Heckert H65 operates 30% faster than the predecessor model.

2. **High cutting capacity:**

With the 60 kW spindle (450 Nm at 10,000 rpm, spindle ramp-up in 2.8 s), it is almost as fast as significantly larger machines.

3. **High load:**

The load of up to 1.5 tonnes increases capacity by more than 100%.

4. **Integratable:**

The Heckert H65 adapts seamlessly to the customer's infrastructure, whether into an existing supply system or through its compatibility with the pallets of older machines.

5. **Automation-friendly:**

Automatic set-up point flushing and optional automated set-up point doors allow for unmanned shifts.

6. **Digital transparency:**

I/O-Link communication up to the field level allows remote monitoring of the status of the machine or individual assemblies.

7. **High process reliability:**

This is ensured thanks to the user-friendly HMI, the swarf conveyor extending to the set-up point, the service-friendly structure and high-pressure flushing as well as the cooling concept.

8. **Future-proof:**

The simple options for retrofitting allow adaptation to changing requirements.

9. **High efficiency and productivity:**

Thanks to reduced downtimes, the new machining centre works faster and with greater energy efficiency – with installation space reduced to 24 m².



A virtual round up: Dr Markus Richter, Director of Development at Starrag in Chemnitz (right), and Martin Brückner, Director Sales Asia/T&I presented the Heckert H65 at a webinar in February.

explains Markus Richter, Director of Development at Starrag in Chemnitz. It is equipped with HSK-A63 retainers and is designed for workpieces up to 1,000 kg. The tool changers are also designed accordingly: While the Heckert H60 operates with the fastest changer for tools up to 10 kg (optionally up to 12 kg) as standard, the robust tool changer of the Heckert H65 handles tools up to 35 kg and optionally up to 50 kg. ▀

Five successful years at the heart of medical technology

In February 2016, the Starrag Group opened its new Tech Center in Immendingen, a municipality ten kilometres from Tuttlingen in Baden-Württemberg in south-west Germany. As the region dubbed the “world centre for medical technology”, the facility is particularly focused on this sector. The Tech Center houses high-precision Bumotec turn-mill centres that can be used to produce manufacturing solutions bringing technical and economic benefits to medical technology manufacturers and suppliers for many applications.



The district of Tuttlingen is not only attractive for nature-related activities; it is known above all else as “Medical Valley” and is home to around 400 medical technology companies.



The Bumotec s181 and s191 turn-mill centres are particularly suitable for the complete machining of small, complicated parts such as implants for orthopaedics, traumatology and dentistry, but also for other medical components and instruments.

On an area of just under 600 m² at its Tech Center, Starrag presents their exclusive technology: The Bumotec top sellers s181 and s191H



In the five years since it opened, the Tech Center in Immendingen was able to increase its network, as well as tests conducted and samples machined; it has been a time full of intensive discussions and shop talk. "Successful years" is how Michael Paulus describes them. He has been head of the Tech Center since the beginning of 2019 and relocated to the district of Tuttlingen in October 2020. A native of Bavaria, Paulus has worked for Swiss company Starrag Vuadens SA for seven years. "At that time, I was the first permanently employed salesperson to sell

Bumotec machines in 'eastern Germany', says the trained precision mechanic and master toolmaker with a smile.

Since then, Starrag has been showcasing their exclusive technology – the Bumotec top sellers s181 and s191H – in spaces measuring almost 600 m². Both machines are high-precision CNC turn-mill centres, which are suitable for six-sided complete machining of demanding parts. The modular design of the s191H series in particular allows it to be configured for a variety of machining

tasks and expanded into a central unit with seven axes and three spindles. Paulus emphasises how the machine is "ideal for many small and complicated medical technology parts, which can be completely turned, milled, ground, splined and even polished in a single operation", adding that "for smaller series in particular, the investment in a Bumotec s181 or s191 quickly pays off".

Bumotec is a well known name in the watch and luxury goods industry. Most of the more than 600 s191's sold are in use



“Looking at it mid-term, I can see our visitors frequency increase and the number of our employees doubling”

Michael Paulus
Starrag Tech Center Manager



there, as well as a total of over 2,000 Bumotec machines. The medical technology sector is expected to catch up, and Michael Paulus and his team of experienced application and service technicians at the Tech Center are doing a convincing job to this effect. “Here in the Tuttlingen area, we have around 400 companies in this sector, employing about 12,000 people in total,” says Paulus. “Many of them are involved in machining and are very interested in our solutions”

How can they be persuaded of the quality and efficiency of Bumotec machines? The original method was to optimise the respective machining process at the Tech Center in Immendingen using sample processing to obtain the fastest possible

cycle times and thereby enable our customers to become more profitable. Michael Paulus is now adopting a slightly different approach. As he explains: “We still conduct special sample processing and carry out tests for our customers, of course. But when it comes to cycle time optimisation, we hand the matters over to our state-of-the-art Swiss-based main plant in Vuadens. Their demonstration and test centre boasts five times the capacity, both in terms of the number of machines and application specialists. When it comes to

optimisation tasks, that is where our customers are in best hands”

Instead, the two Bumotec turn-mill centres in Immendingen, the s181 and s191, are permanently set up and ready to demonstrate their machining strengths using prepared components. “This arrangement has been proven successful,” says Michael Paulus, “because we now have a higher frequency of visitors. On average, one or two potential clients come by every week to see a demonstration of the machines and their capabilities. We also keep in close contact on a weekly



Michael Paulus believes that he and the Starrag Tech Center in Immendingen are in exact the right position: "Many people are enthusiastic medical technicians, accomplished machinists and people with the knowledge and experience in these matters who – like ourselves – enjoy detail and have a constant eye on cost-effectiveness".



basis, in which we discuss requirements and strategies using specific examples". The Tech Center is also a point of contact for representatives of partner companies. When it comes to complete machining of sophisticated medical technology parts, all peripheral devices are important. Companies such as SolidCAM, Condat, Schaublin Spannzangen, Haimer, Rego-Fix and Dixi Fräswerkzeuge are represented on site via a permanent exhibition.

Michael Paulus manages the Tech Center, but at the same time he is the Regional Sales Manager for Bumotec and SIP

machines, both of which belong to the Starrag Group. Whenever time permits, he is on site with his customers. "That is the most important part of my job, and I'm glad that I have the qualified staff in Immendingen to enable the shop to be run without me being around".

Paulus believes that he and the Starrag Tech Center in Immendingen are in exactly the right position: "There are enormous prospects here for us as Bumotec representatives. Many people are enthusiastic medical technicians, accomplished machinists and people with the knowledge

and experience in these matters who – like ourselves – enjoy the details and have a constant eye on cost-effectiveness". Last but not least for this reason, he is convinced that a successful future lies ahead for the Tech Center in Immendingen: "Looking at it mid-term, I can see our visitors frequency increase and the number of our employees doubling". ▀

Starrag STC 800 X provides diverse growth opportunities for Schaller Group



> Expansion expected beyond aerospace, military and automotive

Speed, power and precision are coveted qualities to Justin and Maryann Schaller, both in terms of the Schaller Group family-owned business and in their other shared passion of hydroplane racing. The speed, power and precision of Starrag's STC 800 X is playing a role in both the Schaller business and their racing.

The brother and sister duo have executive positions with the Schaller Group, a third-generation, Michigan-based precision metal forming and assembly company that manufactures parts found in the aerospace, military, automotive and medical industries.

For ten years, the Schaller siblings ran their own CNC machining company but in 2018 opted to bring their expertise back into the family-owned stamping business. The company expanded one of its plants to 8,360 m². Designated for CNC machining, it is one of six specialised

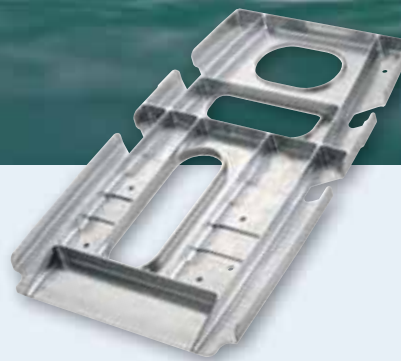


“The speed and accuracy of these machines were important reasons why we chose Starrag”

manufacturing plants operated by the Schaller Group in the Detroit, Michigan area.

Ideal for complex aluminium workpieces

The STC 800 X is ideally suited for machining complex aluminium workpieces due to its precision capabilities and axis configuration. Being capable of continuous five-axis milling with the use of a rotary table and a 120 kW tilting spindle (S1), Schaller is able to machine with up to 120 kW and 30,000 rpm.



With the A-axis range $-100/+60$ degrees, no angle heads are necessary for machining aerostructures. The rotary table allows the economical machining by using a tombstone set-up or multiple parts and fixtures on the same table. Additionally, the STC at Schaller has been integrated into a manufacturing system, allowing flexibility.

The result is speed, power and precision

“This is the perfect machine for our growth plans,” said Business Development specialist Maryann Schaller. “We recently poured the foundation to add a second STC 800 X to our operation, and because we purchased a Flexible Manufacturing System (FMS) with the first STC 800 X, we have the ability to have multiple machines in a single manufacturing line.” One example of new opportunities is medical devices. In March of 2020, Schaller Corporation manufactured and

donated parts for a prototype ventilator project at a University in the hopes of helping with the Covid crisis. And while that project did not take off as hoped, it showed Schaller another market where the precision and speed of the Starrag STC 800 X will be greatly beneficial. "The speed and accuracy of these machines were big reasons why we chose Starrag," said Maryann Schaller.

Buyer's journey was seamless

Schaller Group Chief Technologist Justin Schaller said the customer journey from research to demonstration to purchase to installation of the STC 800 X was seamless. "I don't even feel like a customer of Starrag," he said. "We have a relationship that's really more like a partnership." That relationship formed at the IMTS

(International Manufacturing Technology Show), where Justin Schaller was introduced to Starrag products. "When the right project came along in 2020, it provided us the opportunity to purchase the Starrag STC 800 X."

The foundation was poured and installation was completed in September 2020. However, the project was put on hold because the additive manufacturing customer converted its manufacturing to produce testing swabs for use by health-care professionals during the pandemic. The customer is now re-engaged with Schaller Group to fulfill the original project. "It's typical for us to have long-term relationships with our customers, some extending several decades," said Starrag North America Sales Director Tim Mooney. "The STC 800 X is ideal for machining

1,400 mm or smaller precision parts, which is what Schaller needs for the complex aerospace, defense and specialty industry markets it is expanding into."

Diversify into high performance racing

One such growth area being pursued is high performance racing where the Schallers combine their passion for CNC machining with their love of racing. High performance racing includes watercraft like hydroplanes and sleek offshore boats as well as various forms of auto racing like stock, drag and rally racing. All rely on quality-built aluminium parts. According to Maryann Schaller, "the Starrag STC 800 X is the perfect machine for our expansion into the high-performance racing industry. Our experience racing

Precision, quality, total cost of ownership, guaranteed 95% uptime are all competitive advantages for Starrag's manufacturing technologies.





Example of an aluminium structural part machined on the Starrag STC 800 X



“We’ll be putting in a couple of more Starrag machines”

Maryann Schaller, Business Development specialist

hydroplanes has introduced us to a network of potential customers. The speed of the machine along with the ability to utilise tombstones on a multi-pallet system will allow us to be competitive in the manufacturing of engine blocks, heads, manifolds and other performance racing products.”

Precision, quality, total cost of ownership, guaranteed 95% uptime are all competitive advantages for Starrag’s manufacturing technologies. One Starrag customer, with a nine-machine set-up with FMS, has an uptime of 98%. “Having machines that are highly reliable and able to manufacture the most challenging parts consistently are part of the Starrag guarantee,” said Mooney. “That’s really what drives business, because manufacturers want their machines running 24-7 without the need for constant intervention. We started in the aerospace industry in the

1980s,” said Maryann Schaller. “It’s a great growth market, but we also know the importance of diversifying.” Schaller selected Starrag because the equipment can be utilised in a wide array of industries. It is not just for use in the aerospace industry, but any industry that requires high precision, complex parts. Examples include various racing vehicles, satellites or electrical vehicles. “Starrag’s capabilities allows Schaller to meet those diverse, industry needs,” said Maryann Schaller. The STC 800 X has unique features like a 30,000 rpm, 120 kW spindle, an all steel

gear A-axis, and standard pallet changing. Other key features for optimum aluminium machining include ambient temperature controlled coolant, vacuum clamping, automated part measurement and automated machine calibration. The Schaller Group has poured the foundation for a second STC 800 X and with the anticipated growth and diversification, “we’ll be putting in a couple of more Starrag machines,” said Maryann Schaller. “To us, Starrag and automation make sense.” It’s off to the races for the Schallers in 2021. ▀



The right DNA for agricultural machinery

Heckert machining centres helping to get food problems under control thanks to tailor-made production technology



The world is facing a dilemma: the rising population of the earth needs more food, while the number of agricultural holdings is decreasing. Robust and flexible agricultural machinery that works around the clock very reliably and with high out-put is in demand. Its use is reliant on engines, gearbox housings, axis and other heavy XXL components. The Starrag Group took on this challenge at an early stage. Machining centres in the Heckert product range have proved their worth in the production of these heavy, large and robust cast iron and steel components.



In agricultural machinery, components made of steel and cast iron (in the picture an axis gear housing) are mainly used, which are large and heavy and have demanding contours.

Car, truck and bus: when talking about vehicle construction, these terms will quickly come to mind unprompted for most people. Few people think of tractors, combine harvesters, ploughs, harrows, seed and planters or fertiliser spreaders. Amazingly, our survival depends on this automotive technology.

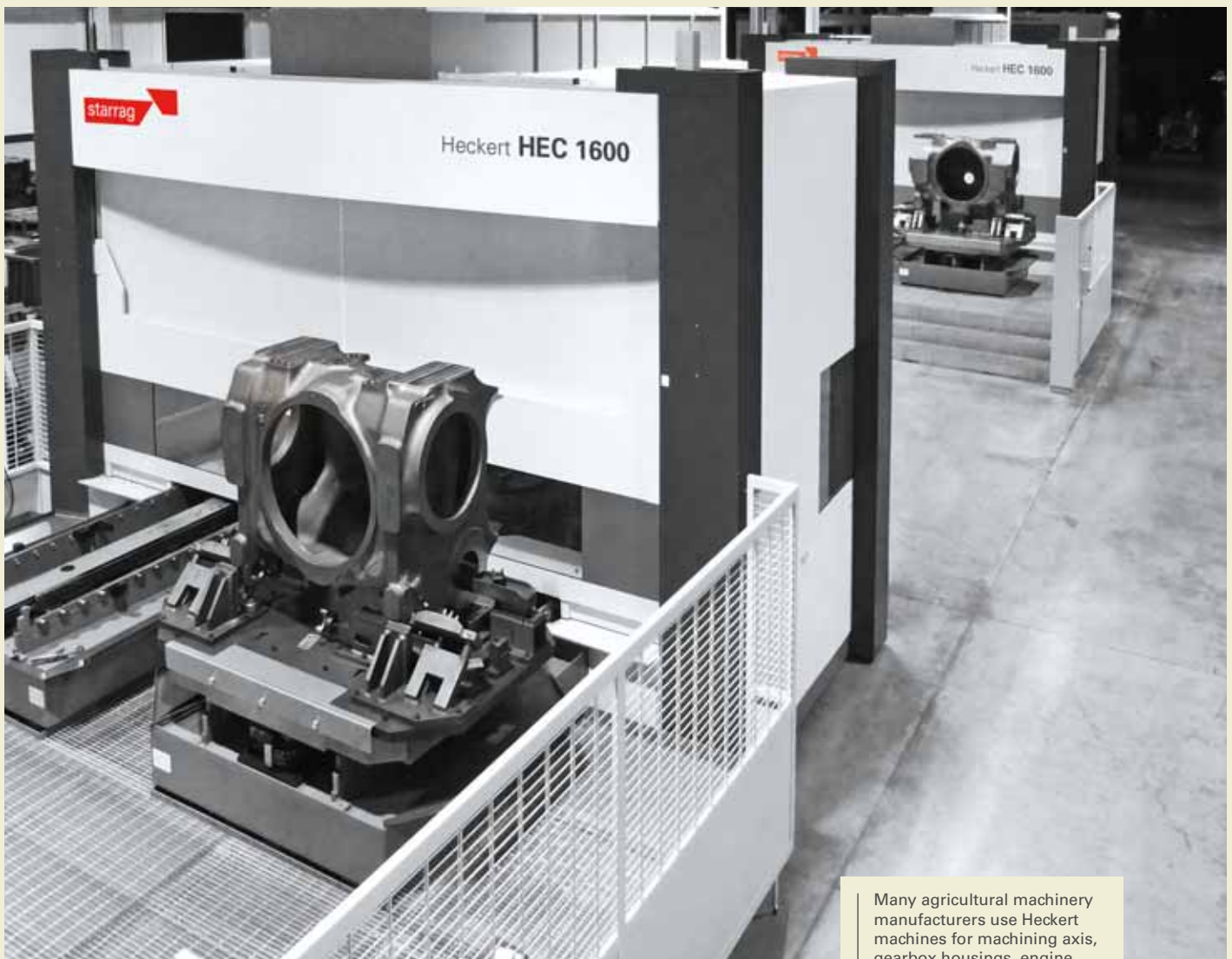
But no matter whether it's a tractor, plough or fertiliser spreader: every type of agricultural machinery technology shares several common denominators. They are usually produced in small batch sizes and are often available in many variants. The requirements placed on production technology are equally high.

"For agricultural vehicles, the light-weight solutions commonly used in passenger cars are hardly ever appropriate," says Kai Bohle, Starrag's Director Sales DACH (Germany, Austria and Switzerland) for the "Transportation and Industrial" segment. "Robust mechanical engineering is in demand, because components made of steel and cast iron are used predominantly. In many cases, they are large, heavy and demanding in contouring."

Heckert DNA increases process reliability

For example, machining axis, gearbox housings, engine blocks, cylinder heads

and hydraulic components requires high-performance machining centres that ensure precise and safe production processes thanks to their torsional rigidity. "These properties are in a sense part of the 'DNA' of the horizontal Heckert HEC machining centres produced in Chemnitz," explains Bohle. "This is why many agricultural machinery manufacturers use our compact Heckert centres, ranging in pallet sizes from 400 to 800 mm. But there is also a high demand in the agricultural sector for the large machines from the Heckert Large Athletic series as these machines feature pallet sizes



Many agricultural machinery manufacturers use Heckert machines for machining axis, gearbox housings, engine blocks, cylinder heads and hydraulic systems.

starting at 1,000 mm × 800 mm and can be used for large-volume and heavy components”.

Cut costs with compact machines

The rigid, thermosymmetrically designed major components, digital AC feed drives, complex profile rail guides and ball-screw spindles in all linear axes are the key to the machines. Chemnitz also equips them with robust, powerful high-torque spindles with high torque that guarantee long-lasting high precision and reliable processes, even in the case of materials that are difficult to

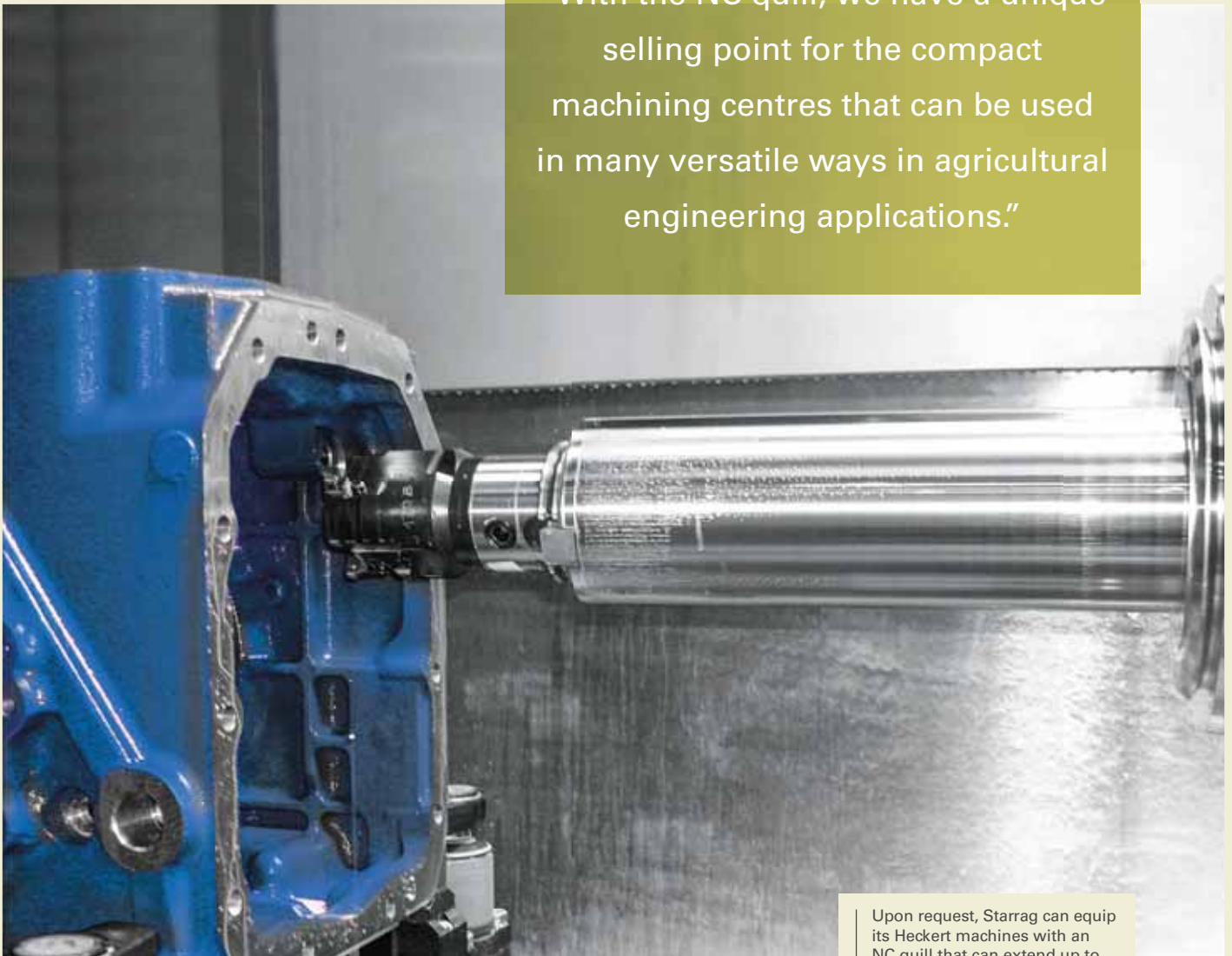
machine. The free chip fall, which has proven to be particularly effective in the case of high chip build-up when cutting cast components with large material allowance, also contributes to process safety. In addition, the axis travel distances are relatively large in relation to the pallet size. Bohle: “The customer may, in certain circumstances, be able to opt for a machine that is a size smaller and thus cut costs”.

Tailor-made to increase productivity

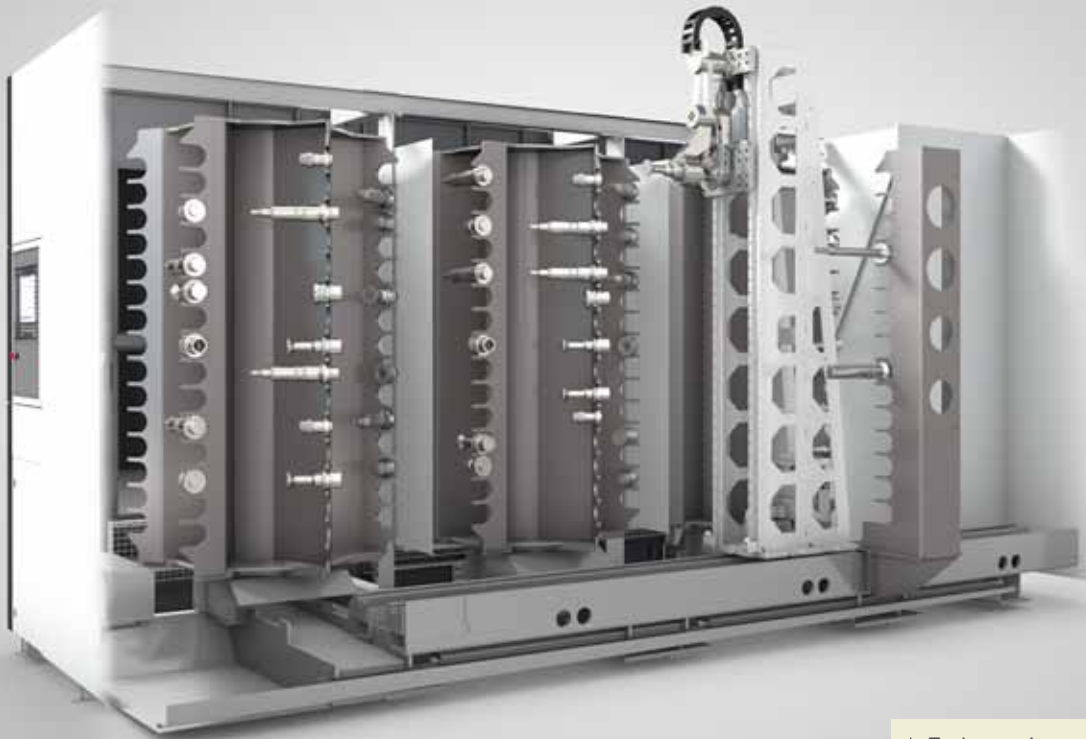
Tailor-made products are often in demand in agricultural machinery manufacturing.

Torsten Leistner, Team Leader Quotation Engineering in Chemnitz, is the specialist for this demanding task. He has been working on customer specific options for a long time – especially for agricultural machinery. Leistner is supported by experts in application technology, automation, layout creation and special designs. “We are able to meet the requirements of agricultural engineering with bespoke, customer specific solutions based on our Heckert machining centres”, Leistner explains. “Together with the customer, we develop the machining technology and design the fixtures and the automation

“With the NC quill, we have a unique selling point for the compact machining centres that can be used in many versatile ways in agricultural engineering applications.”



Upon request, Starrag can equip its Heckert machines with an NC quill that can extend up to 500 mm in the Z-direction on compact models.



Tool magazines with up to 450 places allow automatic insertion and replacement of up to 1,400 mm long tools and bridge tools with a maximum width of 950 mm.

systems that best suit the batch size." The team adapts the solutions individually to on-site conditions and also takes on the optimisation of ergonomics.

NC quill enables axes gears to be machined

A standard process in agricultural machinery manufacturing is the machining of half-axis and axes drives. Heckert machines can also be equipped with an NC quill that can be extended in the Z-direction by 500 mm, for example, for processing the bearing seats in the interior. It has a diameter of 125 mm and operates at a maximum speed of 4,000 rpm. For the larger machining centres with a pallet size starting from 1,000 mm, there is also a quill measuring 150 mm in diameter and with a traverse path of 760 mm.

Safe, stable and versatile complete machining

When quills are used, users can do without expensive, vibration-damped

tools that require extensions and can use inexpensive standard tools instead. Process stability is also increased thanks to the improved length-to-diameter ratio. One thing is clear for Torsten Leistner: "With the NC quill, we have a unique selling point for the compact machining centres that can be used in many versatile ways in agricultural engineering applications. This is because they can be also be used for machining gearbox housings and half-axis with long axis funnels that would otherwise require long tools that are consequently susceptible to vibrations."

Ideal for high-precision engine machining

However, the user cannot always dispense with long tools: they are necessary, for example, when drilling crank and cam shafts on the straight-four or straight-six engines commonly used in agricultural machinery. Long-life drives are called for here. This requires high-precision drilling in a train, since transshipment holes would not guarantee the required quality. A special Starrag solution allows drilling

over a metre long from one side: the Heckert HEC 800 machining centre is provided with a Z-axis with a travel path extended to 2,050 mm as a fixed option. The user can now position a 1,400-mm boring bar in front of the workpiece to drill in a process-safe and stable manner even when drilling deeply.

Tool magazine adds flexibility

In deep drilling, productivity only increases with automation; this is only possible with special peripherals. These include, for example, Starrag tool magazines with a maximum of 450 places: depending on the version and machine, they are able to automatically insert and replace tools of up to 1,400 mm in length as well as bridge tools with a width of up to 950 mm. The magazines are also designed for face milling cutters with a maximum diameter

“An axis clamped above cheek height can be machined on both front faces using a Heckert HEC 800 X5 without the need for reclamping.”

of 340 mm that handle the finishing of large sealing surfaces on the combustion chamber side of cylinder heads and blocks. Larger tools weighing in excess of 50 kg or that have an over-turning moment of more than 70 Nm can alternatively be installed and replaced from the fixture in the spindle using a pick-up system.

Increased productivity thanks to the five-axis design

Heckert HEC centres in a five-axis design are suitable for many machining applications: the HEC 500 to HEC 800 compact centres are equipped with a rotary swivel table for this purpose, while large centres have a swivel head for the fifth axis. With these five-axis machining centres, cylinder heads, axis and complex hydraulic control blocks can be machined much more productively, because the number of clamping positions and unproductive downtime decreases.

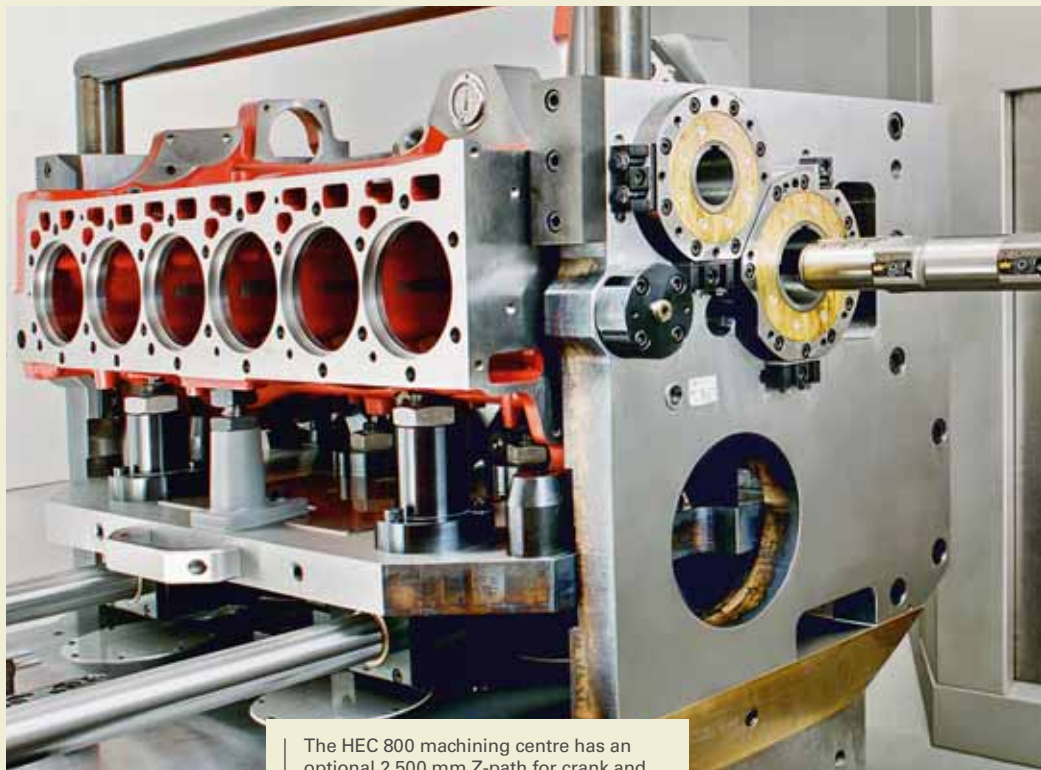
The advantages of the five-axis Heckert centres can also be leveraged when machining the bulky swing axis of agricultural equipment. An axis clamped above cheek height can be machined on both front faces using a HEC 800 X5 without the need for reclamping. The user can also position and precisely fit attachment points along the

longitudinal axis by adjusting the fifth axis. They then benefit from greater accuracy and shorter tool changing times.

Precise complete machining of planetary gear carriers

An additional core capability of the five-axis Heckert machines: then enable complete machining of the planetary gear carriers

installed in the gearboxes and sometimes also in the axis of agricultural machinery. The complete machining ensures precise positioning and thus accurate adherence to the required dimensional and position tolerances of the holes. The integrated turning function eliminates the need to transfer the workpiece to a turning machine. Lastly, the ability to carry out direct toothing in one clamping operation increases the profitability of the machining process. It's amazing what's in the 'DNA' of horizontal Heckert HEC machining centres. ▾



The HEC 800 machining centre has an optional 2,500 mm Z-path for crank and camshaft bores in straight-four or straight-six engines with long boring bars.

Partnership on equal footing

**Droop+Rein FOGS NEO and HD (Heavy Duty):
Double premiere enables a premium job shop
to enter new markets**





CONCAD's managing director, Klaus Schwab (far right), showcases the gigantic dimensions of the 15-metre-long Droop+Rein FOGS HD high-gantry machine to the four CNC milling cutters Felix Hess, Johannes Hennich, Felix Gramlich, Lukas Gärtner (from left to right).

How does a premium job shop conquer new industries? The recipe of CONCAD GmbH from Walldürn is impressive: The successful prototype and tool manufacturer from Odenwald introduced new production and control technology, built an air-conditioned production hall and hired new employees. The courageous innovation process was achieved thanks to the partnership with the Bielefeld-based Starrag team, which guided and continues to support long-standing regular customers from new machine development to commissioning to individual programming.

The magazine **GEO** regards Walldürn as being one of the most beautiful places along the “Deutsche Fachwerkstrasse” (German Half-Timbered House Road): This destination attracts tourists and pilgrims year after year with its medieval city centre, open-air museum, early Roman excavations and the imposing pilgrimage basilica of St. George. A new attraction for manufacturing experts is located a few kilometres outside the industrial area on the edge of the forest: A large, grey cube with a gigantic air-conditioning system on the roof, inside of which CONCAD has been blazing new paths in high-precision machining with a Starrag machine duo since the beginning of 2020.

The **Baden Württemberg-based** company, which already owns a Droop+Rein FOGS M30 high-speed machining centre

and a Droop+Rein TF portal machining centre, has been looking for a machine that can rough very large workpieces with a high machining capacity and also finishes them highly dynamically to meet the utmost demands for surface quality, precision and dimensional accuracy. That’s why managing director Klaus Schwab went on a benchmark tour of the European machine tool industry in 2016 with a harmless-looking test part in which the Baden-Württemberg workers had incorporated a number of common features. Schwab is constantly amazed by the fact that the “old lady” at the factory, the Droop+Rein-FOG machining centre, which is almost two decades old, was able to mill the surfaces just as well as the modern standard machines. The high-gantry machine was also in the benchmark midfield in terms of machining times. This is why it is still in use.

“We actually needed two types of machines – a portal machine with a movable table for very large components and a dynamic gantry machine that can be set up during operation for night, slim manned shifts, among other things,” explains the managing director. “An automotive company would simply use two types of machines, but we cannot afford that.” Since Bielefeld has always been “ready to listen” in the past 20 years, Schwab once again drove to the Starrag plant. There, the experts for large-scale machines suggested combining the two machine types Droop+Rein FOGS and TF into a completely new machine concept. This led to the creation of the Droop+Rein FOGS HD, a powerful, precision-cutting high-gantry machine (X-axis: 15,000 mm; Y-axis: 5,000 mm; Z-axis: 2,000 mm) with extremely high torque (2,400 to 7,500 Nm) and fast, dynamic axes.

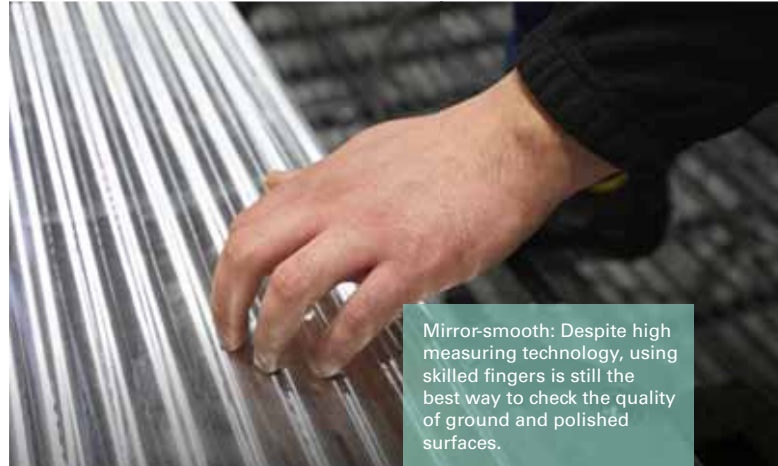


CONCAD has been blazing new, air-conditioned paths in high-precision machining with a Starrag machine duo since the beginning of 2020.

Thanks to the swivel fork head, even complex contours can be machined quickly and precisely.



CNC milling cutters Felix Hess (left) and Lukas Gärtner prepare to machine a steel component.



Mirror-smooth: Despite high measuring technology, using skilled fingers is still the best way to check the quality of ground and polished surfaces.

CONCAD is not only pleased with the new dynamics: **The FOGS HD is about 20 to 30% faster and more economical than a portal machine.**

CONCAD is not only pleased with the new dynamics: The FOGS HD is about 20 to 30% faster and more economical than a portal machine. In addition to the possibility of unmanned production, the option of parallel set-up in the machine at peak times is also a plus for the newcomer. CONCAD already uses them intensively, as an on-site visit showed: The job shop used the entire length of 15 metres to simultaneously process an aluminium housing, a workpiece from the marine area and a deep drawing tool. This is made possible by the safety zones with a partition wall.

The new, fully air-conditioned cube is premiering a new machine besides the FOGS HD – one which is significantly smaller (X-axis: 8,000 mm; Y-axis:

5,000 mm; Z-axis: 1,500 mm): It is the high-speed Droop+Rein FOGS NEO 50 80 N40 C machining centre with a milling capacity in S6 operation of up to 60 kW (1,800 Nm), a new milling unit and a modified C-axis ($\pm 400^\circ$), which can be used for the efficient production of very precise machine parts thanks to its incredible flexibility. The term "all-in-one" fits both machines, with the basic idea according to Schwab being "the purchase of a machine for heavy machining and milling of the standard geometry and a lighter second machine for finishing the surfaces." However, both five-axis machines are suitable not only for fine finishing but also for rough machining due to their extremely highly rigid drives and machine components and thanks to their largely identical equipment and the same control

system (Sinumerik 840D sl). At a speed of 40 m/min, the FOGS NEO operates more dynamically in the linear axes than the FOGS HD, but it does not have the high cutting volume of the FOGS HD.

CONCAD places high demands on the basic accuracy and robustness of the volumetrically dimensioned and calibrated machines, which can perform precise finishing to 15 to 20 μm , thereby implementing the production know-how of CONCAD with extreme accuracy. CONCAD also owes these values to its high investments in machine bases that are several metres deep and the elaborately air-conditioned new building. "When it came to calibration, we realised after a year that it was the right decision," explains the managing director with pleasure. "The calibration specialists measured twice because they could not believe that the measured values in this small μm range had remained constant for a year."



Partnership on equal footing: When problems arise, CONCAD's managing director, Klaus Schwab, often resolves them with the help of Starrag experts such as Dennis Hamm (Application Engineering).

However, CONCAD also owes these excellent results to the Siemens 840D sl control system and the Volumetric Compensation System (VCS) that automatically compensates for geometry errors in the new machine duo. For example, one important task is pressing tools for the automotive industry, which Schwab says is constantly "in search of the μm " when it comes to surface quality and dimensional accuracy. Equally important to the job shop from Odenwald is entering into new industries and new materials with the machine duo.

The company received more than just two completely new machines with a completely new control system and programmes operated by a new team. "There's a lot going on for us," claims the managing director, adding, "Someone from Starrag was always there. And the commissioning was just the beginning – it's only now really starting to pick up speed."

Thanks to the investment in new technology, CONCAD is now very diversified, enabling the company to serve a wide range of industries with



"The calibration specialists measured twice because they could not believe **that the measured values in this small μm range had remained constant for a year.**"

Klaus Schwab,
Managing director
CONCAD

comparably high requirements, such as prototype and tool construction. The company dares not reveal too much, but it can report that it is now

also working for manufacturers of electronics, optics, offshore technology and aircraft components. Recently, CONCAD was even awarded a contract from a research institute for a space project. This context makes it clear that the key word is "multifunctional": The Droop+Rein duo in the fully air-conditioned cube is intended to handle challenging orders from very diverse industries as quickly as possible, cost-effectively and with high precision and process reliability. This is another area where Starrag specialists such as Dietmar Wallenstein (Head of the E-Design and Commissioning departments) and Dennis Hamm (Application Engineering) come into play.



Joint milling order: CONCAD's managing director started a benchmark round throughout Europe with a test part with "integrated common features"

One of the few exceptions to the understandable secrecy rule in this sector is a pool cover of around nine metres by four metres in size, which CONCAD was asked to mill for a South Korean customer. The starting material consisted of multiple

stainless-steel castings welded together in the shape of a figure eight. "Another call was made to Dennis Hamm to collaboratively come up with clever ideas, such as during programming, in order to receive at a special solution of this

magnitude," says Schwab. Yet for Starrag, this is not a one-way street. "I once heard from Mr. Schwab that CONCAD is working on problems of tomorrow that others don't even know about," explains Dennis Hamm. "This will also help us to learn and later on we will use the things we are investing in now for future projects."



Meticulous preparatory work: CONCAD employee Johannes Hennich puts the swivelling B-axis into position.

At the end of many success stories, we are left with the question of what effect the Starrag claim "Engineering precisely what you value" brings: Where did CONCAD come up with exactly what the company especially values with this duo – such as in terms of precision, speed of work and performance? While Schwab agrees with all of this, the relationship with the machine supplier is even more important to him: "What I appreciate about Starrag is Dietmar Wallenstein and his squad, who are always up-to-date and have visions and ideas that we talk about as partners and equals." With such a partnership, it is no wonder that half of the eight total CNC milling machines come from Starrag. ▀

Large-scale potential





“This investment was the right step to achieve the goal we set and add value for us and our customers.”

Patrick Berhalter, CEO

Berhalter invests in a five-axis large-scale machining centre to expand its range of services

Based in Rheintal, Switzerland, Berhalter AG is an innovative company in every sense of the word. Not only is it the global market leader in flatbed punching machine technology, it has also seen great success as a manufacturing service provider. And with the investment in a Starrag STC 1250, this business segment is hoping for larger orders – literally.

Berhalter flatbed punching machines, which are used in numerous stamping plants, printing shops and food manufacturers, are known and loved far beyond the Swiss borders. They are used to produce lids, films and labels for bottles and beverage containers, pharmaceutical products, detergents and animal food in billions of units per year.

CEO Patrick Berhalter is proud of his employees, who have provided innovative ideas and demonstrated a huge commitment to ensuring the company remains a global market leader for its punching machines: “Stamping technology has played an important role in our company for more than 45 years. We have continuously developed our machines and increased the benefits for our customers.” Berhalter machines are the fastest on the market – in particular, the new Swiss Die-Cutter™ B6, which

handles up to 500 strokes per minute to ensure an output of up to 390,000 lids per hour with a 16-up tool, all completely automated in 24-hour operation. Patrick Berhalter describes: “We can punch, deep-draw, emboss, deboss, score and laser on a single machine – none of our competitors can do that. Plus, we guarantee top quality of the products produced.”

“tec-spiration” – the second pillar

Berhalter reached a milestone in 2014, when management decided to restructure the company. Less successful areas such as injection moulding were closed, and today the company's focus is on the die-cutting business and the newly created “tec-spiration” business segment. Tec-spiration stands for the combination of technology and inspiration, as business unit manager Fredi Hasler explains:



Patrick Berhalter (left), CEO of Berhalter AG, Fredi Hasler (centre), Managing Director tec-spiration, and Head of Sales Anton Bischofberger all agree that “the Starrag STC 1250 is not only ideal for aviation parts. We also like to use them for complex mechanical engineering and pump parts made of stainless steel.”



“We are a manufacturing service provider that goes beyond simply processing orders according to the drawings. We work in partnership with our customers, incorporating our own ideas into the process.” Anton Bischofberger, Head of Sales tec-spiration, added: “It is our 50 years of manufacturing expertise, our modern machine pool and our innovative strength that wins customers over. These strengths help us in our constant pursuit to create decisive added value for the customer.”

Over the past six years, tec-spiration sales have grown continuously, mainly due to the increase in new customers. In the meantime, only 25% of the capacity is used for internal tasks – e.g. for the production of punching machine components. Three-quarters of all orders come from external customers from the aerospace, automotive, power generation and mechanical engineering industries. The aerospace industry in particular was

driving growth until the beginning of 2020. “We have been certified for aviation since 2017, which has opened the doors for some well-known companies and led to interesting, demanding orders,” says Fredi Hasler. And then the coronavirus pandemic hit. But according to Bischofberger, the crisis did not hit Berhalter AG quite as hard as others. “We have even continued to receive orders from the aerospace sector during this period. This is probably because we don't tend to supply conventional aerospace companies, and instead manufacture rocket and satellite parts, as well as components for helicopters and drones.”

Five-axis large-scale machining centre opens new doors

The head of the Hasler business unit is confident that tec-spiration will continue to grow thanks to a

number of recent changes, including the investment in a Starrag STC 1250. The large parts machining centre outperformed several competitors and Starrag was able to make an unbeatable offer with a refurbished machine that had been brought up to the standard of a new machine.

Berhalter finally put the refurbished STC 1250 into operation in May 2020. Hasler argues: “This five-axis machine greatly expands our capabilities, since it is designed for the processing of steel, titanium, corrosion-resistant steels and special materials such as Hastelloy and Inconel etc. With its travel paths of 2,200 × 1,600 × 2,100 mm in X, Y and Z, it opens up a range of components that, to my knowledge, no other service provider can offer in our region.” Starrag developed the STC series for the economical processing of demanding structural components, multiblades and

“We can punch, deep-draw, emboss, deboss, score and laser on a single machine – none of our competitors can do that. Plus, we guarantee top quality of the products produced.”

Patrick Berhalter, CEO



“We always need position accuracy to one hundredth of a millimetre – and we can achieve this within the full travel range on the STC.”

Patrick Berhalter, CEO

casings with long cycle times. Their excellent static and dynamic properties as well as the tried-and-tested swivel head set the benchmark for simultaneous five-axis heavy-duty cutting, which is not just a necessity for the aviation and energy production industries. “Of course, it was our range of parts from the aviation sector that led us to the STC 1250,” says Fredi Hasler. “But we also use them for challenging machine and pump parts made of stainless steel, for example, which require high stability for cutting large holes. And we love that we have the option of multiple clamping for small parts.”

Impressive performance

The **tec-spiration team** was particularly concerned about the quality of the machining centre, which has a robust machine design and thus offers stable, low-vibration machining processes,

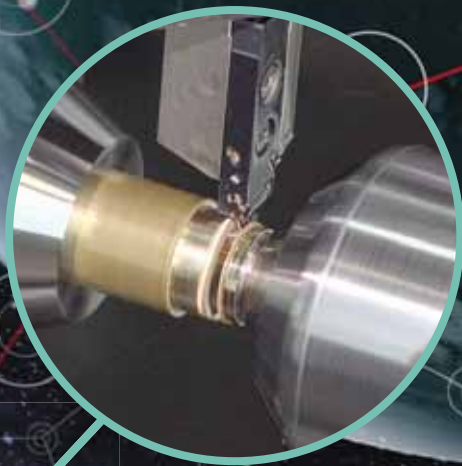
precise machining and high productivity. “Starrag has an excellent reputation for this, which our work results can attest to,” says Head of Sales Bischofberger. And he is a good judge of that. After all, like Fredi Hasler, he has years of experience in machine tools and worked as a production manager earlier in his career. Bischofberger gives an example: “We always need position accuracy to one hundredth of a millimetre – and we can achieve this within the full travel range on the STC.”

The **improved** five-axis capability of the Starrag STC 1250 also puts it ahead of the large machining centre previously installed at Berhalter. In addition to the three dynamic linear axes, the CNC rotary table acts as the fourth simultaneous axis. It has a high-torque, a high-damping drive and can be clamped hydraulically. The swivel head is the simultaneously controlled fifth CNC axis. Thanks to the

robust screw drive and the stable roller bearing on both sides, it is particularly suitable for heavy-duty cutting. Another advantage over the previous machine is the two-pallet changeover contact, which enables set-up during the machining time – something that was previously not possible. “This is a crucial feature,” says Fredi Hasler, “as it allows us to keep the machine running permanently and also feed it with long-running five-axis parts or use multiple clamping during slim-manned shifts. The higher capacity utilisation allows us to reduce machine costs significantly.” In order to meet the increased tool requirements, the STC 1250 installed at Berhalter is equipped with a tower magazine with 240 places. All in all, Hasler and Bischofberger are certain that the Starrag STC 1250 will be a long-term success. “This investment was the right step to achieve the goal we set and add value for us and our customers.” ▀

Business boost for NASA Spinoff





Amorphology executives came across the Starrag booth by chance during the EMO Hannover 2019 show while seeking a CNC machine that could produce micro gears using novel metal alloys, such as bulk metallic glasses (BMGs).



Amorphology, a NASA spinoff company founded from technology developed at JPL and Caltech, is a leader in applying advanced materials and manufacturing technologies toward improving non-lubricated gears for robotics and other industrial applications using amorphous metals.

"We met with numerous companies, including machine tool builders from Japan, Germany, Switzerland and other countries," said Stephen Ceplenski, Amorphology's Chief Growth Officer. "As we were new to the machining industry, we actually had not heard about Starrag's Bumotec product range prior to the show, however, when we walked by their booth, we were immediately impressed with some of the micro-gears they had on display."

Following the EMO show, Amorphology conducted machining tests with several companies, including Starrag, to assess the precision, cycle time and overall capabilities of the machines as they cut a relatively unknown BMG alloy.

In order to cut the part, Starrag had a special cutting tool made and delivered to Amorphology's Pasadena, California, laboratory along with several sample parts showing the capabilities of machining BMG to high precision.

"We were focused on finding the top high-precision, small/micro-part, machine tool builders so that we could assess which machine we would purchase to meet our rapid prototyping, mold insert cutting and post-processing needs," said Amorphology's Chief Operating Officer Jason Riley. The Bumotec s191H outperformed all the other machining manufacturers.



Relationship geared to grow business

Starrag asked, and received, material with CAD files of Amorphology's micro-gear prototypes. Test cuts were performed at Starrag labs in Switzerland and Kentucky. "We produced several batches of sample gears for Amorphology to evaluate. They were impressed with the micro-precision results produced by the Bumotec s191H," said Greg Dunkley, Starrag Vice President Sales Precision Engineering North America. "From there, we entered into discussions about how we could work together to grow our respective businesses. It was agreed that Amorphology will showcase the Bumotec s191H in its Pasadena lab for their customers and our customers to view." Amorphology will be making a wide variety of parts using the Bumotec s191H, from mold inserts to rapid prototype gears, as well as other production BMGs and traditional metal parts. "We are targeting high-precision parts with tolerances often <math>< 5 \mu\text{m}</math> on certain dimensions," said Riley. "The majority of our work is focused on rapid prototyping and production quantities in the 100's of parts per month."

BMGs and other amorphous metals have advanced features over steel, titanium and aluminium. Amorphology's patents with several metal alloys are based on developing gears for space and other extreme cold temperature applications. Amorphous metals are a non-crystalline class of alloys that cut and chip differently than other materials.

“The Bumotec provides the mill-turn capabilities that we currently don't have, as well as a higher production capacity,” said Riley. “The Bumotec supplements our current capabilities and provides us with capabilities that we don't have.”

Cobots, robots and medical devices

The Bumotec s191H has the capability “of offering us a unique value proposition,” said Ceplenski. “Bumotec can take our alloys and machine single pieces. Or instead of machining one part at a time, it can produce 100's of pieces lights out.”

Besides making gears for aerospace, Amorphology's gears are made for use in cobots, robots and medical devices. For example, most cobots use strain-wave gears – the main component being a flexspline. It is complex, thin-walled, and fulfills an important role – to precisely move the arm of the robot.

Many of the cobot, robot and medical device parts can be cast or injected molded, but at times the micro-parts need to be post-processed to extremely high tolerances. “Starrag ‘cut its teeth’ in designing Bumotec machines for the Swiss watch industry,” said Dunkley. “Bumotec machining centres have a talent for machining micro-size high-value gears.”

The Bumotec s191H is the result of blending Swiss mechanics and state-of-the-art axis drive technologies. The cast iron three-point machine base and linear drives eliminate vibration which yields superior surface finishes. Advanced kinematics and thermal management allow the implementation of numerous high speed machining operations in a small footprint.



“We are targeting high-precision parts with tolerances often < 5µm on certain dimensions”

Jason Riley, Chief Operating Officer

“We project that the Bumotec s191H will make our own micro gearboxes without lubrication in robots and medical devices,” said Ceplenski. “We will be machining our patented alloys to very small sizes where production quantities don't require our injection molding process.”

The value proposition for Starrag is that the parameters developed with these amorphous metals will be developed on the Bumotec. “Everyone has preloaded parameters for common alloys, such as aluminium,” said Ceplenski. “What about amorphous metals? We will be developing those parameters on Bumotec, and as we scale, we will be the only location capable of using those parameters on earth.”

A chance meeting in a distant land results in a business relationship that will be out of this world and a future-changing step forward in CNC machining of amorphous metals. ▀



starrag

Engineering precisely what you value

Heckert

For those who want more
from everything.

The new Heckert **H65**



20%
cost reduction

due to shorter cycle times and
improved process safety with
reduced space requirements.