

Pietro Rosa TBM invests in a Starrag LX 021 machining centre for the highly effective and efficient machining of blades

Complete solution for airfoil components with multiple turbine blades

Process time and footprint halved

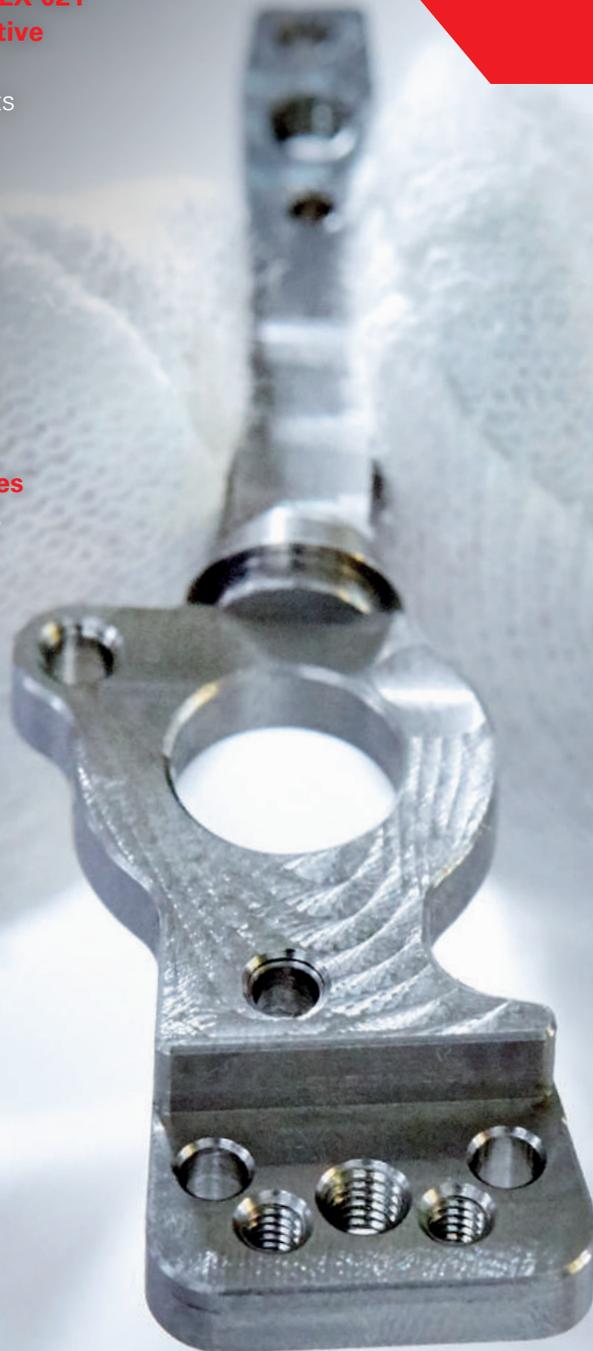
Planetary gear carrier machining in just two clamping positions

What is the secret to outstanding power plant components?

They have withstood wind and weather for over 60 years

Helping companies to help themselves

New two-week course turns customers into ECOSPEED experts



**Bumotec s191 machining centres:
A team of two – for 9,000 hours of
continuous operation**

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The logo for starrag, featuring the word "starrag" in white lowercase letters on a red background that is shaped like a stylized arrow pointing to the right.

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Dr Christian Walti
CEO of the Starrag Group

Dear reader,

In the many conversations I have had about the coronavirus crisis, I noticed that we are suddenly communicating more intensively. As we can no longer participate in visits, trips or conventions, all of our communication now takes place over the telephone or via a video conference.

I am therefore sure that we will overcome every aspect of this crisis, because there is one word that has suddenly increased in importance: We. The exciting projects in our new customer magazine Star make me confident that we are already in a good position for this.

For example, Italian precision forgers Pietro Rosa TBM and Starrag have developed the LX 021 machining centre, which allows complete machining of turbine blades. US company Orizon Aerostructures has even built a new factory around its new flexible production system comprising nine five-axis ECOSPEED machining centres, which will “eclipse everything we have ever done in the past” (Orizon-CEO Charlie Newell).

“What is the secret to outstanding power plant components?” is also a fascinating read about Harbin Electric Machinery Company, based in China. The power plant manufacturer chose a double-column vertical lathe from the Dörries VC product line to machine XXL components – not only because of its high-precision operation and efficiency, but also because the protective shut-off function means it continues to operate for over 15 minutes in the event of a sudden power failure.

Starrag is particularly proud to have sold its 600th Bumotec s191, which it has been manufacturing for 15 years. Bumotec customers often order additional machines of the same type – for example German length measurement specialist Kroeplin. After purchasing their first machine, the company's order volume increased so much that it decided to buy a second Bumotec s191. One of the first centres was purchased by Swiss company Del West Europe, a supplier of components for motorsport, who has since acquired a second s191 – the 600th sold. What do these customers have in common? They both swear by good dialogue and active communication with Starrag.

Karl-Hubert Jacobs from the Starrag Customer Training team demonstrates active dialogue in the Advanced Maintenance Training course, where customers and Starrag service technicians learn how to replace a spindle in just two weeks. During the course at the Mönchengladbach plant, participants not only learn from each other, but they can also benefit from the expertise of staff in specialist departments. This is “we” at its finest.

Find out what else we all have in common in the latest edition of Star, 01-2020. I wish you good health as we start this journey together.

Christian Walti



Remote service: The technical hotline and service advisors help customers to find faults and can often fix them remotely.

Strategy for the effects of the coronavirus pandemic

→ Service precisely what you value

As is the case for most businesses, Starrag customers are currently having to deal with production downtime, a lack of orders and a reduced workforce due to the coronavirus crisis. They need a service that can react to this new, constantly changing global situation with a high degree of flexibility in order to survive.

For manufacturing companies to continue working efficiently in these times, machine suppliers must provide a customised service strategy. But how can this be done at a time when travel is limited and companies are taking their responsibility to keep employees safe extremely seriously?



“We use a wide range of measures to ensure that machines fail rarely or not at all.”

Günther Eller, Head of Customer Service

Provision for failures

The fundamentals of our service strategy, introduced by Head of Customer Service Günther Eller, are not changing. Two years ago, he said in an interview: “We offer our customers service solutions tailored to their needs. The service often starts before the failure occurs: We use a wide range of measures to ensure that machines fail rarely or not at all.” Customer training, condition monitoring, regular predictive and preventive maintenance by Starrag experts and tailored ServicePlus concepts are all proven instruments for preventing unplanned downtimes

and maintaining the value of the machines. And just in case there is an incident ...

Teleservice and remote diagnostics

Customers can use the Starrag Service Hotline to speak to staff directly. Starrag has an extensive infrastructure for providing remote service, which enables staff to quickly and reliably assist the customer with any kind of machine fault via the Internet or the Service Hotline. Specialists analyse the current machine condition and use this information to help eliminate faults. In times when travel

restrictions are in place, this service can be extended to include remote repair.

Agile transport logistics provide a reliable parts supply

This strategy has proven successful for many years, so it remains unchanged. The only new approach that Starrag is taking is to adapt almost every day to the changing conditions worldwide. All global Starrag logistics centres are still open and responding rapidly to new challenges in terms of transport logistics – from limited flights to long queues at the borders.

Deploying technicians to customer sites

The Starrag Field Service will continue to attend service call-outs as far as this is permissible and possible under the current conditions. Starrag currently also has the resources available to carry out spontaneous maintenance on machines that are currently not being used due to the coronavirus crisis.

The aim of all measures remains to be able to offer customers measurable added value when it comes to service, even if the external influences have become more challenging. ▽



Complete solution
for airfoil components
with multiple turbine
blades.

Pietro Rosa TBM invests in a Starrag LX 021 machining centre for the highly effective and efficient machining of blades

No company could survive for over 130 years, if it didn't have a progressive outlook and continually pushed the boundaries with leading-edge product design and development, as well as world-class production techniques. Italy-based Pietro Rosa TBM can be counted among that number.

Starting life in 1887 producing tools for the agricultural industry, the company soon moved into fine cutlery, which remained the core business until after World War II when it began developing and manufacturing more complex forgings such as net shape steam (in the 1950s) and gas turbine blades (in the '60s) for major Italian and international OEMs.

Since then, Pietro Rosa TBM has developed over 1,500 products in 30 different materials - including special steels, titanium alloys, aluminium and nickel alloys – and has maintained a high level of intellectual property in hot forming, machining and welding technologies at its site in Maniago, north east Italy.

While continuing its position as a world-class precision forging operation, in more recent years the organisation has progressively expanded, most notably by:

- In the 1980s, machining forged blades for the energy sector;
- In the 1990s, forging and machining titanium and nickel-based super alloys;
- In 2000, introducing the supply of aerospace components, including the production and delivery of engine-ready workpieces; and
- In 2010, the high-volume manufacture of aerospace compressor blades.

The success in today's global aerospace sector of the family-owned company can be judged by a forward order book of \$800 million. This is generated by, for example, jet engine airfoils (compressor airfoils as well as variable, rotor, stator and discs), aero structural products as well as land-based gas and steam turbine blades. It is also served by a satellite production facility in Connecticut, North America, at New England Airfoils Products, NEAP – which has multi-year agreements with major aero engine OEMs.

As a group, Pietro Rosa TBM produces LP and HP compressor blades, blisks and fan blades also for Rolls-Royce and GE, of varying size from 20 to 1,000 mm. In Italy, production is a wide mix of 150,000 parts/year, while the US site produces 300,000 units in fewer varieties.

"We've evolved over recent decades by effectively taking manufacturing operations based on individual skills sets and 'systemising' those skills into best-in-class production," says President & CEO Mauro Fioretti. "And now especially, with an extensive forward order book coupled with the need to operate under cost-down pressures, we increasingly continue to work closely with Starrag to improve machining processes, particularly for our high-value products."

He adds: "Indeed, our Starrag machines are used in support of all of our programmes, including single- and multi-bladed products."

Andrea Maurizio, Chief of Technology, explains the move into titanium and super alloys: "With engines operating at higher temperatures, there is an increasing need for compressor blades of titanium and nickel alloys. But these heat-resistant super alloys are more difficult to machine, polish and test. So, while we not only need the best 5-axis milling machines, we also must have smart fixturing, and high-level process automation and process monitoring, as well as a dependable supplier which is responsive and has superlative technical support."

Working closely together, Starrag's applications department and Pietro Rosa TBM's engineers – led by Mr Maurizio – have recently developed a process involving the appropriate programmes, special fixturing and clever tooling (ceramic for roughing operations and solid carbide for finishing) to produce multi-bladed airfoil components. Each of the super alloy multi-bladed compressor components is machined into the required shape, with very tight tolerances throughout – including within 50 microns on the profile.

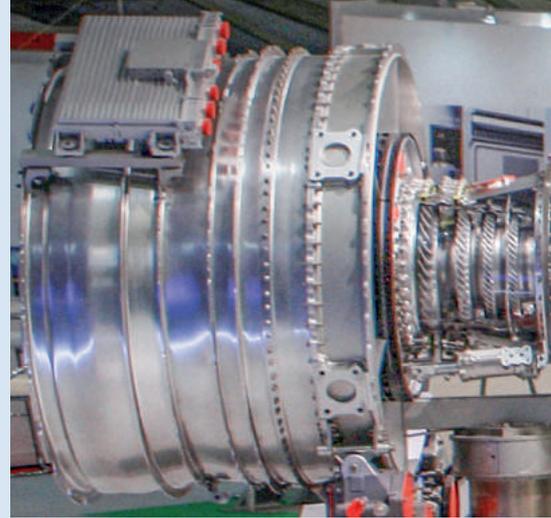
The process sees each multi-bladed component successfully completed in-cycle, then passed to a coordinate measuring machine for inspection. Ten sections on each blade are measured, equating to thousands of features on each component section.

“We originally discussed machining the airfoils from forgings,” says Mr Maurizio, “but rising order volumes negated this approach – due to the relatively long lead times involved in forgings – in favour of machining from bar. However, a number of production issues had to be overcome before the process was guaranteed as repeatable, not least the avoidance of distortion especially between the roughing and finishing operations.”

Pietro Rosa TBM’s most recent investment in Starrag machining centres, the LX 021, has been specifically designed by Starrag for the highly effective and efficient machining of blades. It is a 20 kW/22.5 Nm, 30,000 rpm 5-axis vertical machining centre and has a 4,000 rpm turning capacity (axes A1 and A2). It has X-, Y- and Z-axis travels of 400 mm, 200 mm and 410 mm, respectively, plus 360 deg. in the A-axis and -45/+95 deg. in the swivel, B-axis.

Other machining centres are available, so why did Pietro Rosa TBM choose Starrag machines? “Starrag is not just a machine supplier,” says Mr Maurizio. “It is a company that is willing to work very closely with its customers to develop end-to-end answers involving not only machines but also specific fixturing and tooling.

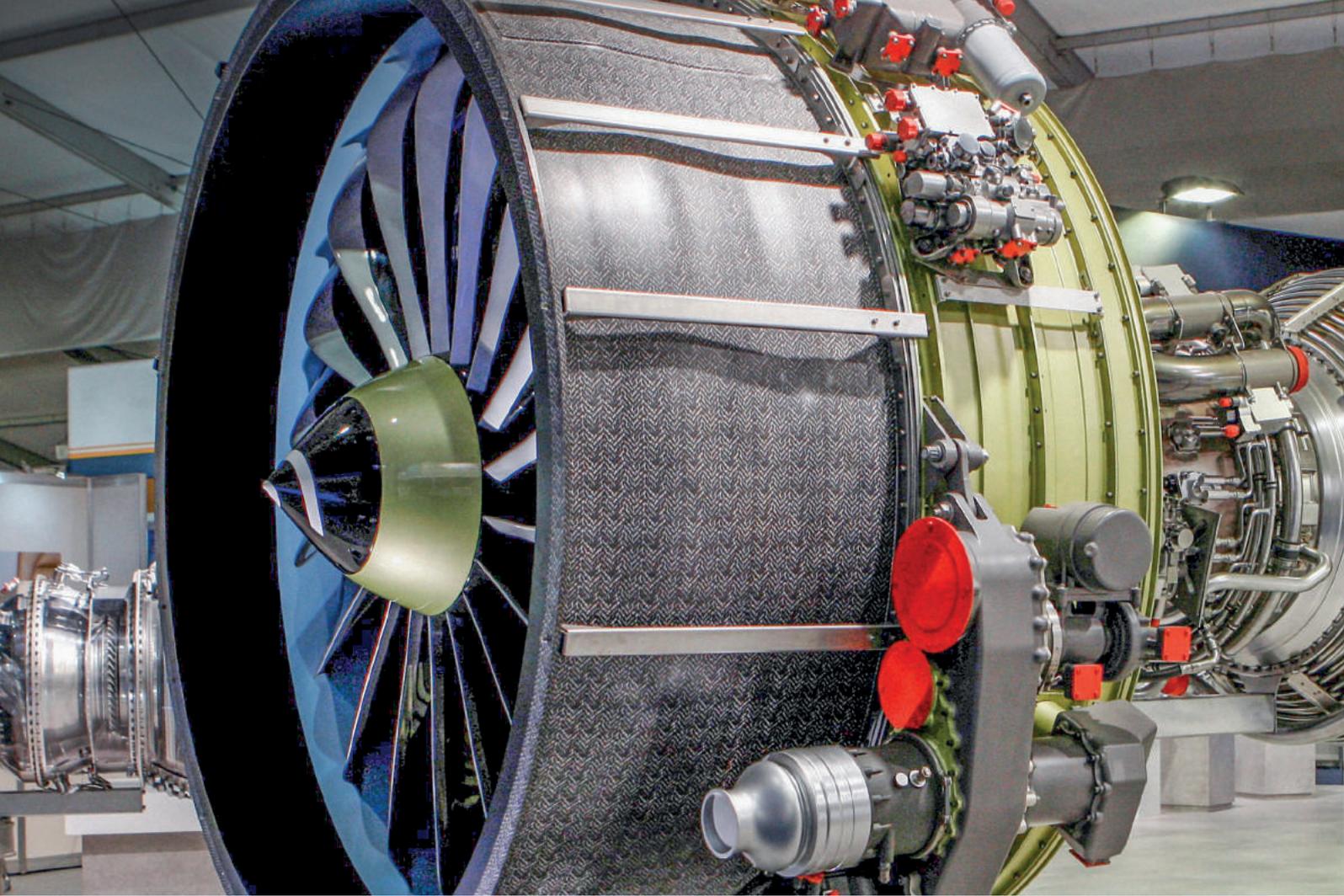
The multi-bladed airfoil blade machining programme reflects Pietro Rosa TBM’s adavance that strategic partnerships are essential for innovation.



Pietro Rosa TBM’s Chief of Technology Andrea Maurizio (right) and General Manager Francesco Parisi (left).

“Vitaly important were the machines’ built-in adaptive milling routines provided by the RCS computer-aided machining (CAM) software, Starrag’s Integrated Production System principles that are inherent on the machines. These, for example, include ERP-interfacing cell management software and process quality control that avoids collisions via 3D-modelling.”

The multi-bladed airfoil blade machining programme reflects Pietro Rosa TBM’s adavance that strategic partnerships are essential for innovation. “Our joint partnership with Starrag has enabled us



“Our joint partnership with Starrag has enabled us to overcome the problems of complexity of machining such components”

to overcome the problems of complexity of machining such components,” says General Manager Francesco Parisi. “Starrag has certainly been a catalyst for achieving this while at the same time instilling an extreme level of customer confidence in its ability as a solutions provider as well as a machine supplier.”

He adds: “The fact that some customers buy-in 80% of their requirements is a big driver for us and our expansion plans. In addition, ongoing cost-down initiatives and the continual rising demands in blade surface integrity have spurred continuous improvement in

our production regimes – with the latter demanding ever-higher levels of milling – as we support customers through the engine lifecycle. This is where our use of Starrag machining technologies comes into play.”

Mr Maurizio adds: “With machining increasingly becoming highly complex, spurring higher levels of flexibility by key suppliers such as us, we need to automate as much as we can and include as many multiple processes as possible into flow lines. As aircraft programmes continue to grow with relatively low batch sizes gradually being replaced

by stable, higher-volume quantities, it is clear that automation is the key to cost-competitiveness.”

So, what’s in store for Pietro Rosa TBM’s next 130 years? According to Mr Fioretti: “It is essential that we capitalise on all the manufacturing know-how that has been established over the years; connecting data and connecting best-in-class companies (as we do with Starrag) and perhaps use techniques such as artificial intelligence for technology capture and transfer so that we can continually improve.” ▀



New horizons in world-class aerostructure machining

Today, more than half a century after singer Gene Pitney put America's southern central state of Oklahoma on the world map with his hit song '24 hours from Tulsa', another phenomenon is bringing global recognition to the area – Orizon Aerostructures. Orizon Aerostructures is a manufacturing and technology company that is building something unique in the Midwest with six locations and 763 employees dedicated to aerospace manufacturing and complex sub-assemblies – almost 72,500 m² of production area at sites in Kansas and Missouri as well as Oklahoma – including four machining locations which between them utilise 100 CNC machines (50 of which are 5-axis/or more).

But it is the company's newest plant in Grove, a little under a 90-minute drive from Tulsa, where a new tune in manufacturing excellence is being played.

In a purpose-built factory that is part of a total investment of \$50 million plus in ten ECOSPEED F2060 machines, Orizon has installed a flexible manufacturing system (FMS) based around nine Starrag 5-axis Ecospeed machining centres. And it is setting new standards in the machining (predominantly milling) of aerostructures. The FMS – the largest integrated system of its type in the western hemisphere – is enabling the company to achieve:

- At least a 30% reduction in machining times across all the parts, compared to former methods.
- A massive improvement in surface finish with much less deburring and polishing requirements.
- An amazing revenue to capex ratio and 2–3 times revenue per person over traditional methods of machining.

"That's no surprise," says Starrag North America's Managing Director Udo Herbes, "the Ecospeed is able to convert a 550 kg aluminium billet into a 24 kg complex structural part in less than four hours when the machine is running at a maximum cutting volume of up to 10,000 cm³/min"

Incorporating the nine high-speed (50 m/min traverse rates) Ecospeeds that are fed by an automated rail-guided, 18-station pallet system and completed by an integrated washing/drying cell, the FMS is manned by just five people on each of the two daily shifts for 24/7 operation to enable Orizon to achieve the extraordinary machining benefits on the range of aerostructures – primarily wing spars, skins and bulk heads for the leading Original Equipment Manufacturers (OEM) in Aerospace and Defense.

Orizon's forward-thinking machining philosophy is certainly paying dividends, and the company's attitude towards its



Charlie Newell
CEO
Orizon Aerostructures



Henry Newell
President
Orizon Aerostructures



Josh Fink
Vice President of Machining
Orizon Aerostructures

investment is clear, as CEO Charlie Newell outlines: “In October 2016, we dreamed of building something unique and building it in just 12 months; a new factory to house a new FMS that would produce machining efficiencies to surpass anything we’ve ever encountered,” he says.

“Working from the start with Starrag, together we have created an unbelievably formidable and highly successful partnership for world-class machining of aerostructure parts. It was clear, even before the first machine sale, that Starrag was willing to listen and to share and support our vision. Starrag has done this by, for example, offering excellent levels of knowledge transfer and assisting us to develop the appropriate processes around our business systems.”

He adds: “These include standardising machining operations (using standard tooling) across all the parts and, for instance, the use of online diagnostic tools that enable Orizon (and Starrag Technology at Mönchengladbach) to ‘interrogate’ the system or individual machines via smart phones, iPads or desktop computers at any time of the day or night.”

Online diagnostics are just one aspect – and benefit – of Starrag’s Integrated Production System (IPS), a modular digital platform that aligns with Starrag’s ‘Engineering precisely what you value’ philosophy by offering users a suite of functionality to meet individual tasks, including:

- Cloud-based solutions help users analyse and optimise processes more specifically to further increase productivity;
- Machine Production System (MPS) that monitors production in real time and protect the machine against incorrect operation/collisions;
- Process Quality Control where a chatter monitor warns of dangerous vibrations when machining; and
- An integrated Machine Qualification System (MQS) that will inform about machine condition and, where necessary, will display the corresponding maintenance instruction(s).

“Orizon chose Starrag ECOSPEED F2060, each with a Sprint Z3 parallel kinematic machining head and an angular milling head,” says Orizon President Henry Newell,

because “the machine produced everything Starrag said it would in terms of metal removal (up to 10 m³ of chips each hour by each machine), reliable uptime (97%) and excellent surface finishes (courtesy superb jerk speeds).”

“It was also clear that Starrag was a company we could truly trust and one with common values in attaining world-class machining results,” he adds. “Even one chip not removed in one pocket timely could cause a \$20,000 part to be scrapped – and nobody can afford that!” It was not, however, a case of Orizon simply placing an order for the initial six machines for the FMS (with the plan to add another three machines – and perhaps more in the future). Orizon first installed a stand-alone Ecospeed with the Sprint Z3 head to thoroughly test the machine’s effectiveness and efficiency on production parts to achieve what Josh Fink, Vice President of Machining, says “will provide customers with faster, better and more affordable production”.

The FMS – the largest integrated system of its kind in the western hemisphere, is enabling the company to achieve:
– At least a 30% reduction in machining times across all the parts, compared to former methods.

Orizon's original ECOSPEED F2060 sits alone in its own area, enabling the 8,000 m² factory floor to host the FMS which began development as a six-machine FMS. The first ECOSPEED F2060 for the FMS was installed in January 2017, followed two months later by the pallet system, and the system was in production by October 2017. A year later, three additional Ecospeeds were added – “and importantly”; says Josh, “these latter three machines did not add any labour overhead to the system; just revenue.”

Starrag's ECOSPEED F2060 has travels in X, Y and Z of 6,300 mm by 2,500 mm by 670 mm (spindle in horizontal position) and traverse rates of 50 m/min in each axis. In addition, the +/- 45 deg. A-/B-axis is complemented by a 30,000 rpm, 120 kW spindle that offers a torque of 83 Nm and can run non-stop at 30,000 rpm in S1 mode. The specification is additionally

enhanced on a machine with high dynamics in acceleration of up to 1 g in all 5-axes and jerk up to 200 m/s³.

The load/unload station sees the parts (up to 12 different parts per pallet – though workpiece size, especially heights, are ideally standardised on each 2 metre by 6 metre pallet, each one capable of accommodating loads of 5,000 kg) loaded manually and clamped by a mixture of vacuum and mechanical clamps, with the pallet in the horizontal position. Once loaded, the pallet is tilted 90 deg. and is moved into the 82 m long FMS, with the sophisticated cell controller ‘deciding’ which machine will process which pallet.

With common tooling held by each of the Ecospeed's 129-station toolchangers, meaning that any ECOSPEED F2060 can machine any part in any order, the cell control system provides the ultimate in

flexible manufacturing. Orizon worked closely with Starrag to standardise the tooling and machining speeds and feeds, as well as programming routines, to enable this high-level flexibility of production.

After machining, the pallet moves to the wash/dry station where high-pressure wash nozzles direct angled jets to reach every corner of a part before an air blast is used for drying. That said, by using minimum quantity lubrication (MQL), workpieces enter the wash station bearing a relatively low amount of swarf/cutting fluid. Upon unloading, the pallet returns to the horizontal and each part is removed from the system for deburring then onto a co-ordinate measuring machine for 100% inspection.

Each of Orizon's Ecospeeds features a Sprint Z3 parallel kinematic machining head, which boosts the machine's ability for highly-dynamic, simultaneous

Orizon has installed ten Starrag 5-axis ECOSPEED F2060, nine of them with a flexible manufacturing system (FMS). This is setting new standards in the machining field of Aerostructures.





Watch Orizon's Success Story

five-axis/five-sided milling and drilling. The head uses three parallel linear axes drives mounted radially equi-spaced in the headstock. The spindle platform is connected to each drive via rigid levers with pivots at each end and a ball joint at the other.

When all three axes move simultaneously, the spindle is moved in a straight line in Z; synchronised motion of the three Z-axes allows the spindle to follow any path within a spherical cone of +/- 45 deg. at a maximum of 80 deg./sec. If the three axes move differentially, the spindle platform will be tilted in the A/B kinematic.

Each machine has an integral C-axis to allow the use of automatic interchangeable angular milling heads which operate at every spatial angle between -135 deg. to +135 deg.. These heads effectively make each machine a 6-axis unit, for accessing and machining otherwise difficult-to-reach areas.

Standard HSK A63/80 taper tooling is used, as well as 'mono' tools up to 50 mm diameter. All tools feature RFID chips for effective tool management. One measure of the collaboration between Orizon and Starrag is the fact that the latest three Ecospeeds installed feature design 'tweaks' to meet Orizon's needs – modifications to the pedestrian door, improved lighting for in-machine cameras and an improved access door for maintenance routines, for instance. Orizon operators undertake basic maintenance routines which are complemented by Starrag's ServicePlus preventative maintenance scheme – where an annual fee covers every eventuality and guarantees service response times, inspection and repair.



With common tooling held by each of the Ecospeed's 129-station toolchangers, meaning that any ECOSPEED F2060 can machine any part in any order, the cell control system provides the ultimate in flexible manufacturing.

Having achieved such gains in machining efficiency, Orizon is not resting on its laurels, however, as Josh Fink points out: "System performance is continually scrutinised, with conference calls every week between us and Starrag to discuss machine availability levels (currently 97%) and spindle utilisation (87% targeted). Yes, it's all very well having such targets but the key is being able to reach them. It's simply a case of continual improvement."

Service comes first for Starrag North America

With more than 700 Starrag machines in operation across the United States, Udo Herbes is very clear on where the company's ambitions lie – now and in the immediate future.

"While the aerospace market is really driving Starrag's US market, followed by the industrial and heavy automotive (for example, mining and off-road vehicles) sectors, it is clear that we have to continue to grow our team, certainly of service technicians, to meet customer demands for exceedingly high machine uptimes. We have to ensure that every customer is always happy."

He adds; "With a central spares location in Kentucky, with parts on overnight delivery if required, and with service technicians at various locations throughout the States, we will continue to guarantee to have a machine back up and running within 48 hours of any problem." ▀

Helping companies to help themselves

New two-week course turns customers into ECOSPEED experts

“Service is not just the name of a department; it is an approach.” This mindset helped turn five experienced fitters in Mönchengladbach into ECOSPEED service professionals in just two weeks. In its new Advanced Maintenance course, the Customer Training team provides practical training that helps users help themselves.

One example of successful work from the training team: In late autumn of 2019, five trained fitters came to Mönchengladbach to dive deep into the world of ECOSPEED. The group was made up of three skilled workers from one of Starrag's regular customers in the aerospace industry, as well as two Starrag employees. “We not only provided these mechanical service technicians with expertise related to their field, but we also trained them in commissioning and application technology,” says Karl-Hubert Jacobs, a member of the training team. “We used to have two or three experts go to the customer to carry out a spindle change.” In the future, the customer will be able to carry out a spindle change on an ECOSPEED on their own. The course is aimed at both customers and Starrag service technicians.

What does the course involve?

Advanced Maintenance Training (AMT) is a two-week course and is usually intended for a maximum of three participants due to the amount of space available on an ECOSPEED machine. The ECOSPEED White Tail is used – a special machine for research and development that the team at Starrag Mönchengladbach usually uses to carry out tool tests and other trials. The course primarily focuses on replacing the spindle. “We demonstrate how to carry out a spindle change without having to completely dismantle the C-axis” explains Jacobs. “The old spindle is removed from the only partially dismantled C-axis and the new spindle is installed. This procedure saves a lot of time.” This is followed by typical tasks such as adjusting the lubrication and the electrical parameters and commissioning the new spindle



AMT is designed for success: In Advanced Maintenance Training, Starrag shows how to perform a spindle change without completely dismantling the C-axis, as is usually necessary.

motor. The participants then check the reference points of axes A, B and C, which may have to be set again if there is a deviation.

Finally, the participants learn about the work and responsibilities of an application engineer, for example compensating the Z3 head using three processes – in addition to the 40-degree test and the ball test, this task includes using the ECO-TRIM CNC program, which automates the first two processes. ECO-TRIM also enables operators to calibrate the machine in a rapid, fully automated process. Jacobs adds: “We explain to the participants in detail how these three processes affect the geometry of the machine, and the benefits of each process.” The next step is to replace an angled milling head with the new spindle, check and adjust the C-axis



and change the tool in the trimming head. Automation is another key focus of the training, and the tool robot – nicknamed the “Wero” after the German term Werkzeugroboter – plays an essential part in introducing the participants to the various adjustment tasks.

“A particular advantage of the way this course has been designed is that unlike changing a spindle in the normal production process, there is no time pressure and therefore plenty of time for questions,” explains the trainer. “We plan a full week for this so that we have enough time to check connections, for example.” In addition, the White Tail training machine does not have to be built as quickly as possible – unlike customer machines – and is solely used for training for the entire training period.

This eliminates on-the-job training, which is often ineffective. “We learn from each other, sharing which sequences have proven to be successful during the work. This allows us to further optimise our work processes in different areas.” In addition, the fact that the course is completed at the Mönchengladbach plant means staff from the relevant specialist departments can be easily consulted to answer specific questions from the customer. The Starrag Customer Training department offers AMT to customers for

an additional fee as part of its training programme. This training complements the operating, maintenance and programming training that Starrag offers to customers when they order a machine. All training courses are conducted in German or English, and qualified interpreters can be booked for other languages. The success is proof for Starrag: At the beginning of 2020, Jacobs turned employees at an aircraft manufacturer into ECOSPEED service professionals in the first two-week course. ▀

Karl-Hubert Jacobs from the Starrag Customer Training team during the new Advanced Maintenance Training: “There is always an opportunity to exchange ideas about how to carry out work.”





The Dörries VC 6500/600 MC double column vertical lathe is manufactured in a portal design and has a maximum machining diameter of 6.5 metres workpiece weight of 200 tons.

What is the secret to outstanding power plant components?

They have withstood wind and weather for over 60 years

Harbin Electric Machinery Company Limited (formerly known as Harbin Electric Machinery Works) was founded in June 1951. The company's main business areas with social and national responsibility include design and manufacturing, technical services, installation, commissioning, operation and maintenance as well as the modernisation and conversion of large-scale power

generation plants. These include applications in hydropower, coal, nuclear power and gas energy – and through this, the company has been able to overcome wind and weather for over 60 years.

Qingfei Gao, Deputy General Manager of Harbin Electric Machinery Works, part of Harbin Electric Machinery Company

Limited, describes the general situation of the company as follows: "Since the founding of the People's Republic of China, Harbin Electric Machinery Company Limited has implemented many well-known power plant projects both domestically and abroad, including the Three Gorges Dam. As a company it plays an important part in the production of large and medium-sized power plant components in our country."

In 2015, Harbin Electric Machinery Company Limited won an invitation to a tender for the construction of eight 1,000-MW hydroelectric power plants on the right bank of the Baihetan Dam, including their auxiliary facilities. The power plants have the largest individual plant capacity in the world. The Baihetan hydroelectric power plant currently under construction is an important national energy project, as it plays a significant

role in the implementation of strategic energy provision from the west to the east. Once completed, it will be the second-largest hydroelectric power plant in the world – after the Three Gorges hydroelectric power plant.

Its construction is also of great strategic importance for the promotion and development of the Yangtze River Economic Belt. Optimising China's energy infrastructure, promoting renewable energy and reducing emissions are important national goals.

The construction of the dam with its associated hydroelectric power plants highlights China's ability to implement major projects in the energy sector. Moreover, it will also improve flood protection in the river basins. The project will support the economic development of the reservoir region.

Strict requirements for the vertical turning machine Dörries VC 6500/600 MC

Harbin Electric Machinery Company Limited sees a continuous internal improvement process as an important

part of the Baihetan project. Projects that are so closely connected to people's livelihoods not only need to be accurately planned out, but also implemented with efficiency. Harbin Electric Machinery Company Limited conducted an extensive market study and comparison of suppliers to select the right production equipment for this project. These included aspects such as brand reputation, cost efficiency, service ability and application-related technical parameters. The selection process was finally won by the Dörries VC 6500/600 MC, a complex CNC turning and milling centre produced by Starrag.

Yi An, a senior application engineer at Harbin Electric Machinery Company Limited, said: "Starrag machines are already used by other subsidiaries of

the Harbin Electric Group, where they fully satisfy expectations on account of their excellent quality.

As the Harbin Electric Group is the largest and most efficient company in the industry for key projects such as hydroelectric power plants, the requirements for the production facilities needed are very high. Workpiece weights of up to 200 tons need to be taken into account. Very few vertical turning machines with a machining diameter of 6,300 to 6,500 mm can meet these requirements. However, this is not a problem for Starrag's vertical lathes. In addition, they have a positioning accuracy of 3 microns, which in practice amounts to just 2.5 microns. This is outstanding compared to the 5-micron positioning accuracy of other commonly

Yi An, senior application engineer at Harbin Electric Machinery Company Limited, explained that the company had carried out a comprehensive market study and comparison of suppliers to guarantee that its production requirements would be fulfilled.



"Starrag machines are already used by other subsidiaries of the Harbin Electric Group, where they fully satisfy expectations on account of their excellent quality."

According to chief mechanic Mr. Yi An, "under such a large volume, Dörries VC 6500 / 600 MC can still operate for more than 15 minutes under the power-off protection in case of sudden power failure, so as to ensure the safe and stable stop of the machine tool, reduce the rate of broken parts and greatly guarantee the safety of production."

used machine tools. Furthermore, the machine is equipped with an extensive set of attachment units, including an angle milling head, a universal milling head, an electric grinding head and an angle milling head for machining internal areas. This greatly expands the potential applications of the machine, which is particularly suitable for individual and small-batch production.

Li Qiu, the application engineer for the Dörries VC 6500/600 MC, elaborates further: "This machine is not only a turning and milling machine in the simplest sense, but it also enables the milling of special contours such as round holes, threads and square grooves on the end face. This is comparable to the capabilities of a drill. Previously, we needed several different machines for the different machining steps. Today, however, we

can do everything in a single clamping operation with this machine tool alone, thus significantly improving the machining efficiency." He added: "When machining very large workpieces, we had to place the parts on a vertical drill with the aid of a crane, for example, in order to be able to carry out the second machining step. It took two days to just clamp and align the workpiece. With the Dörries VC 6500/600 MC, which combines turning, drilling and milling functionality in a single machine, we can carry out the entire machining process on the unit in the same clamping operation, which saves us more than 20% of throughput time. This not only reduces personnel costs, but also significantly improves the machining accuracy.

In addition, the surface finish is very good for horizontal machining. In the past, after turning flat surfaces, we had to put these

through an additional grinding process in order to achieve the desired surface qualities. With the new Dörries, we already meet the requirements for a level surface after the turning stage, meaning that the grinding process can be omitted entirely."

Many machine tools on the market cause production errors and safety incidents in the event of sudden power failures or other emergencies. However, companies like Harbin Electric Machinery Company Limited place great importance on ensuring their machine tools have power failure protection to guarantee that, in the event of a power failure, the operator can safely terminate the production process to avoid production errors and accidents. According to senior application engineer Yi An, the Dörries VC 6500/600 MC can still operate for



Mr. QingFei Gao, deputy general manager of Harbin Electric Machinery Works.

"The new Dörries turning and milling centre from Starrag enables Harbin Electric Machinery Company Limited to manufacture even more efficient and accurate components."



Harbin Electric Machinery Company Limited, workshop for hydroelectric power station

The rotors for the hydroelectric turbines, which would have previously required two machine tools, can now be machined in their entirety on a Dörries VC 6500/600 MC.



more than 15 minutes thanks to its shut-off protection in the event of a sudden power failure, so as to ensure that the machine tool comes to a safe and stable stop, to prevent expensive and important parts from being scrapped and of course to guarantee the safety of production.

Service and efficiency are the highest priority

The progress of any important energy project is naturally closely linked to the living circumstances of the people of the respective region. Adherence to the schedule of the project is therefore a critical factor. According to Qingfei Gao, Deputy General Manager of Harbin Electric Machinery Works: "Following

"More than 20% of throughput time is saved. This not only reduces personnel costs, but also significantly improves the machining accuracy."

the purchase of the complex CNC turning and milling centre, the engineers of the Starrag Group responded quickly and accurately to the needs of the customer throughout the entire project phase, working conscientiously and responsibly and displaying extreme diligence in operator training. The ready for operation handover was completed one month before the projected date. The new Dörries turning and milling centre from Starrag enables Harbin Electric Machinery Company Limited to produce even more efficient and accurate components.

This is fundamentally due to the high productivity of the machine as well as the reliability and technological configuration level of this German-Swiss joint production. The machine will be an important part of the development of our company and will help to open up new markets," he explains.

With its claim of "Engineering precisely what you value" and its long-standing close cooperation with its customers, Starrag is opening up new markets for its clients. ▀



Making ideas a reality requires expertise, courage and perseverance. These two Heckert T45 machines with automation cell are the result of a vision that was born at Voith and created by Starrag.

Process time and footprint halved

Planetary gear carrier machining in just two clamping positions

Two Heckert 5-axis horizontal machining centres connected to a robot cell are used to produce process-intensive planetary gear carriers. Setup times are hardly significant, and the automated pallet, gripper and tool handling as well as the intelligent choreography of the individual machining steps ensure the shortest possible process and throughput times. Voith benefits from a high level of precision, efficiency and process reliability, which enables the company to increase its productivity, reduce unit, tool and equipment costs and save production space. No other manufacturing solution on the market currently offers such a deep level of process integration.

State-of-the-art power-transmission machines serve as the automated gearboxes. They consist of a large number of interlocking components that can be driven by force and torque. There is a wide range of different types, and vehicle manufacturers require maximum performance and robustness in addition to low weight. Finally, the gearboxes must feature exceptionally smooth running and extremely little friction loss.

Gear manufacturers must be able to deliver different variants in changing quantities to the assembly line of the

automotive companies at exactly the right time. This places high demands on manufacturing plants, processes and logistics. In 2018, gear manufacturer Voith signed off on the construction of a plant for the automated production of planetary gear carriers. The requirements set out in the specifications were very demanding: With an annual production of several thousand parts, multiple different component variants would need to be produced flexibly with only two clamping positions. It goes without saying that the requirements for precision, fault tolerance and process reliability were also high. "At first, this seemed to us to be

quite radical, and at first glance it looked difficult to accomplish with the standard technologies and procedures," recalls lead Project Engineer Matthias Gündel. "But with a good amount of engineering expertise, a development mentality and a close cooperation with Voith, we were able to take on this challenging project."

The requirements set out in a specification can usually be implemented in different ways – but not all solutions are ultimately productive or even efficient. This is exactly where creative engineering knowledge and decades



“Highly integrated production steps and fully automatic conversion **are unique features for this plant.**”

Friedrich Oberländer, Director Production Technology at Voith

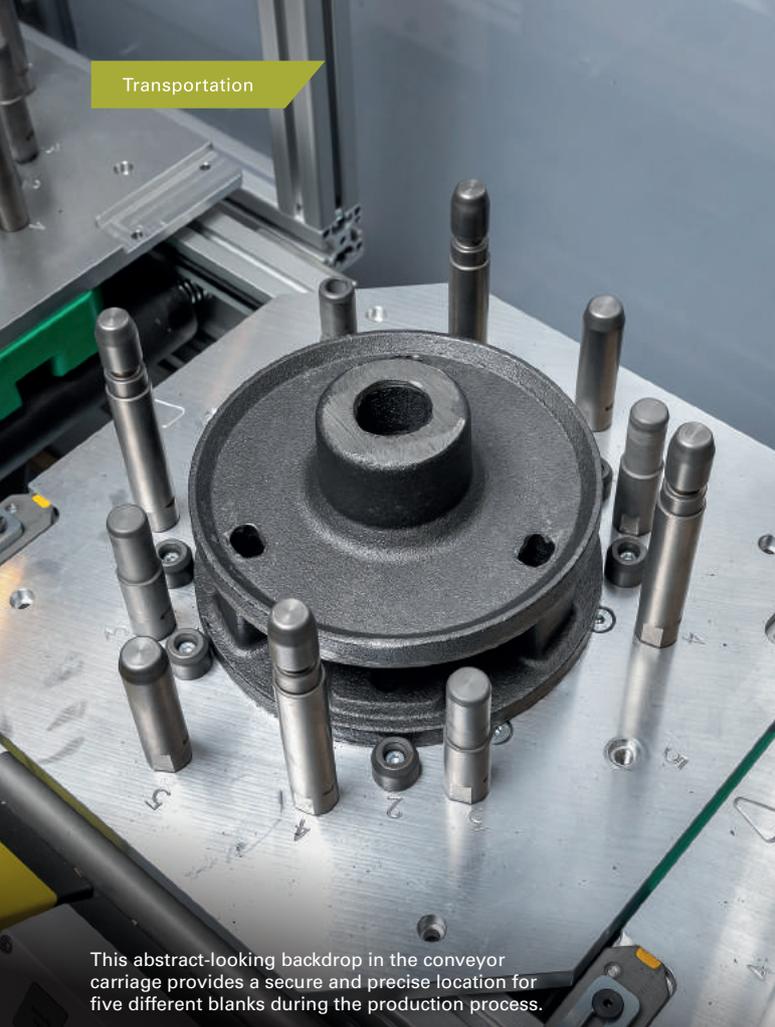
of experience in technology and processes come in to play. For years, Starrag has enjoyed an excellent reputation as a manufacturer of highly productive horizontal machining centres for cutting, turning and drilling workpieces. Chemnitz-based Heckert machines provide the leading solution for processing cubic workpieces, especially for applications in the transport industry, wind energy or precision machine construction.

Starrag engineers and designers, together with Mittweida-based automation specialist SAV, enthusiastically set out

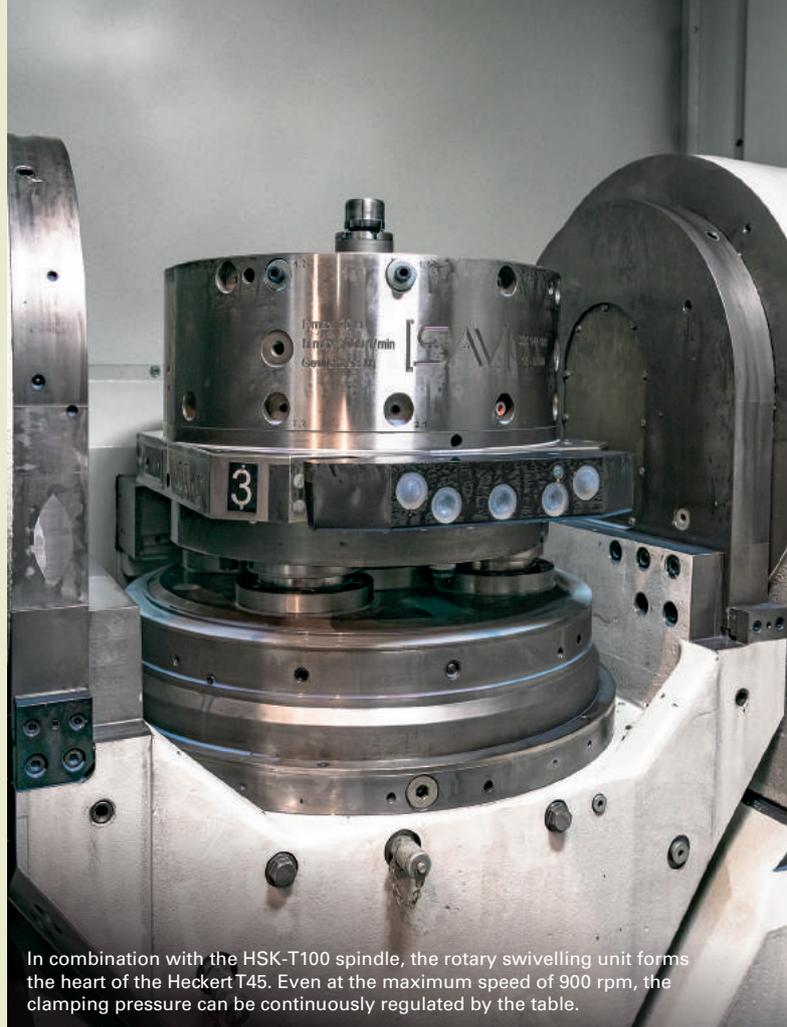
to develop a unique production plant. “It quickly became clear that our proven Heckert T45 machining centre would be able to meet the existing requirements for turning, cutting and drilling. But the particular challenge was to develop automated, time-saving solutions for preparation and setup in combination with clever process handling,” says Gündel.

In fact, the planning and implementation phase was a teaching and learning project for all involved. “Highly integrated production steps and fully automatic conversion are unique features for this plant. Ultimately, this was only possible

through close cooperation between all parties involved across all stages of the project, from conception to the installation of the production plant in our facility,” says Friedrich Oberländer, Director Production Technology at Voith in Heidenheim. The automated handling, logistics and production solution consists of two compact Heckert T45 5-axis horizontal machining centres and an integrated robot cell. The robot effectively functions as a master and orchestrates the entire automated processing plant, checking the incoming components and loading or unloading the two processing centres. Identical or differing type variants



This abstract-looking backdrop in the conveyor carriage provides a secure and precise location for five different blanks during the production process.



In combination with the HSK-T100 spindle, the rotary swivelling unit forms the heart of the Heckert T45. Even at the maximum speed of 900 rpm, the clamping pressure can be continuously regulated by the table.

“With this **innovative production solution**, we are able to **halve the previous process time.**”

Nico Lämmel, Application Engineer

can be machined. The extremely short process and throughput times are partly thanks to the robot automatically setting up the required grippers and type-specific pallets during the main machining time. When the operator approves a new series for production via the HMI, the robot changes all equipment within just eight seconds. The required gripper and pallet applications are pre-assembled and ready to be picked up in the robot cell storage system.

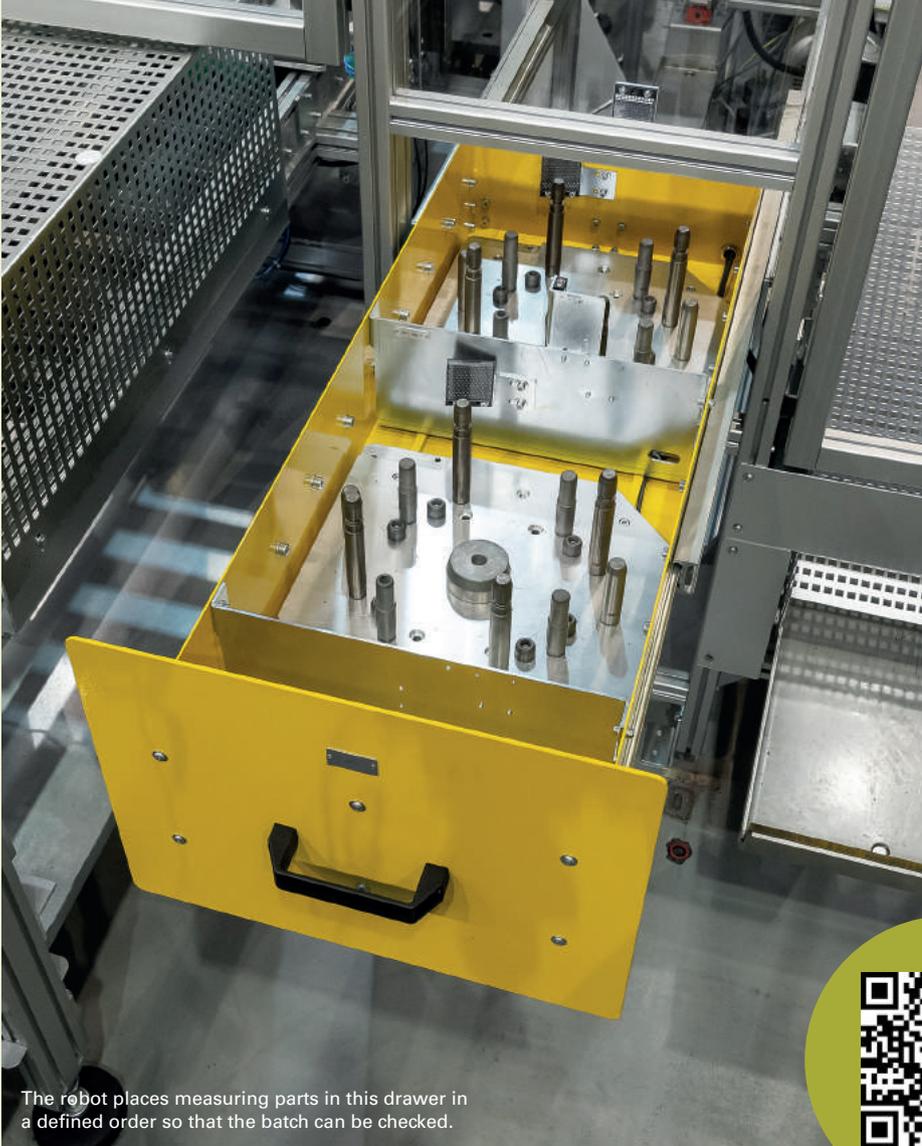
“**With this** innovative production solution, we are able to halve the previous process time. While the plant is processing the

component on both sides in less than ten minutes, the robot uses the bulk of this time to prepare the next workpiece,” emphasises Application Engineer Nico Lämmel proudly, who programmed the essential parts and finally set the plant in motion.

As the change from machine to machine and the associated re-clamping, installation of clamping devices, tools and sometimes even part cleaning processes that are typical in standard production are no longer necessary, the total throughput time is also drastically reduced. The chosen production

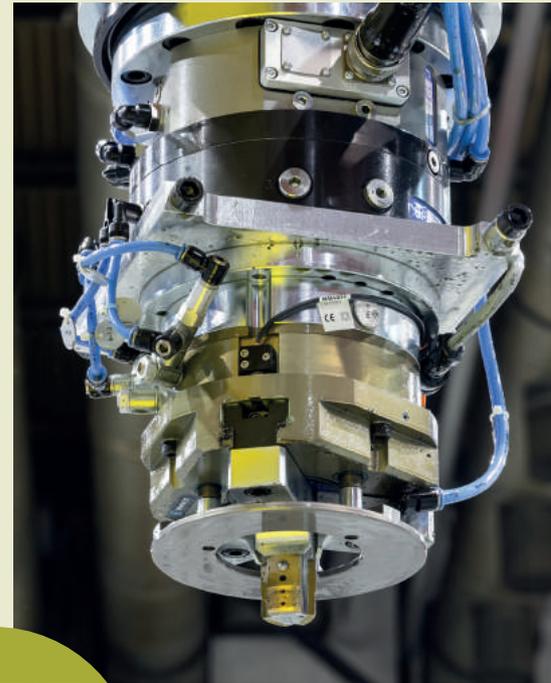
solution offers an optimal flow of parts and therefore a small work in process (WIP) inventory. Intermediate storage of the components on dedicated free surfaces is therefore no longer necessary. “We know from experience that, depending on the organisation of process logistics and intralogistics, the production of a component series can take a long time until it is ready for assembly. With the new plant, we have been able to achieve this demonstrably faster,” says Nico Lämmel.

The extent to which users benefit from additional advantages can be seen by directly comparing the previous process and the new, integrated production process from Starrag: “Assuming an annual output



The robot places measuring parts in this drawer in a defined order so that the batch can be checked.

The robot automatically equips itself with the required gripper to match the component. A special attachment is also available for quickly changing the fixtures.



See more about the production of planetary wheel carrier with the Heckert T45 on this video.

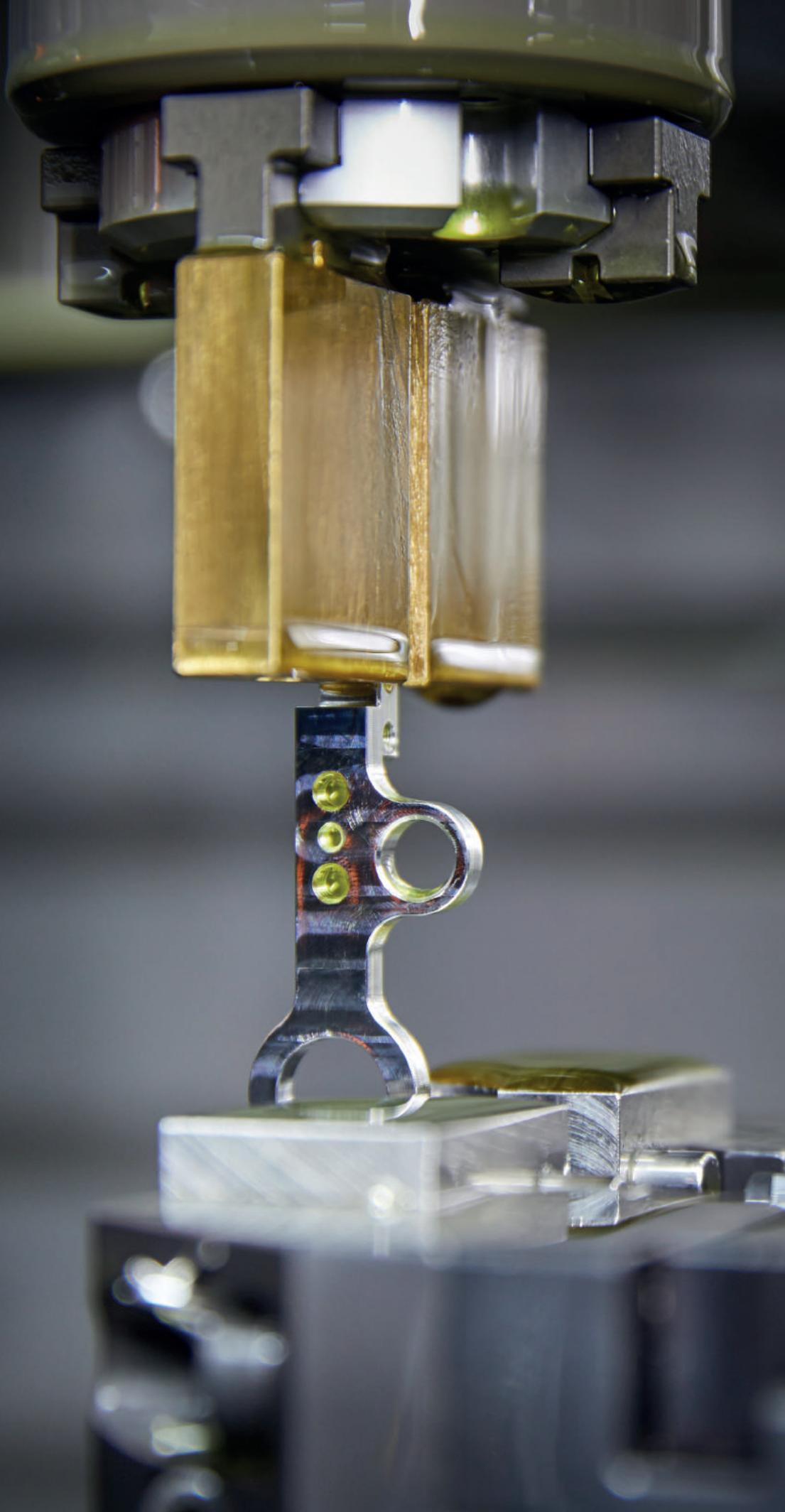
of 50,000 parts per year, this plant is not only allowing us to cut the process time in half, but – depending on the application – the user can increase their productivity per unit area by up to two and a half times, reduce tool costs by around a quarter and reduce equipment costs by 50%,” said Marketing Manager Christian Queens. “It’s not every day that you get so many USPs from one product!”

A closer look at the actual machining process demonstrates why the chosen production solution offers maximum precision and reliability: Once the component is clamped, an optimally co-ordinated sequence of roughing, smoothing, turning, spindle, cutting and drilling operations begins with fast start-up and deceleration rates. The magazine features

60 tools for various tasks, some of which can change from internal to external processing in less than one second. There are also multitools with various lathe tools, which eliminate the need for tool changes. “The Heckert T45 handles all machining tasks with an extremely high level of precision. The central element is a powerful rotary table with a maximum speed of 900 rpm, which replaces the multiple lathes used in the standard process. Thanks to the HSK T100 tool holder and five axes, Starrag is the only company to offer a horizontal machining centre that can combine clamping hydraulics with mill turning,” explains Nico Lämmel. The integrated process sequence clearly shows how Starrag is able to transform demanding requirements into innovative solutions.

Voith was already impressed

with the efficiency, performance and speed of the system during the initial demo run. The highly innovative production solution is proof that standard turned parts do not have to be manufactured exclusively on lathes. “The special feature of the plant is that the unproductive setup process is carried out during the main machining centre time, which drastically reduces the throughput time. With this optimised and flexible design, we are able to manufacture different components in multiple variants and respond directly to customer requirements,” summarises Friedrich Oberländer. An intelligent solution that is sure to attract interest in the automotive industry and beyond. ▀





A team of two – for 9,000 hours of continuous operation

The first is blue and the second is white, but that's the only difference between the two Bumotec s191 machining centres from Starrag that have already proved their worth at the Hessen-based company Kroeplin, which specialises in dimension measurement. After the first, blue, Bumotec machine had been operating continuously for four years, the company decided to purchase another one with the same extras – this time in white. It was a wise decision; the two machines jointly guarantee 9,000 operating hours per year.

“This is one of the reasons why we needed a second Bumotec,” says Markus Deberle, Managing Director of Kroeplin GmbH, holding out a tiny metal component towards our photographer, Ralf Baumgarten. It’s the measuring contact tip of the smallest probe arm of an electronic probe, which measures lengths of between 2.5 and 12 mm. The supremely delicate component is made from stainless steel 1.4301, and is around 20 mm long. Its distinctive features include extremely small radii (0.4 and 0.1 mm) and a thickness of less than 0.8 mm in certain sections. This component makes it possible to examine grooves for hydraulic seals easily and accurately (to name but one example).

In the past, it was manufactured using several different mechanical and manual procedures. According to Deberle;

“The Bumotec means that we can mill a finished stainless steel component from a single piece of stainless steel bar, even during an unmanned shift, without the need for any manual labour at all.”

The company uses a total of almost 20 machine tools both in Schlüchtern and at its second site in Mariánské Lázně (Czech Republic). This includes not only the two Bumotec machines but also four CNC lathes, four CNC milling machines, three horizontal machining centres and some specialist machines. “We originally chose the Bumotec because the medical technology parts manufactured on the machine were very similar to our components in terms of geometry and material,” recalls Deberle. “I was impressed by the wide range of components and the option of using a bar feeder. This made it possible for us to

operate the machine during unstaffed shifts at night and at weekends.”

In 2013, the Managing Director decided to buy a Bumotec s191 milling and turning centre – in blue, as was standard back then. Choosing the right machine is absolutely vital for a medium-sized manufacturer. According to Deberle, “Basically, we select our machine tools according to what we want to be able to manufacture on them. The machines must be a good fit for the range of components that we currently produce and that we plan to produce in the future.”

Michael Paulus, Regional Sales Manager at TechCenter Immendingen explains the situation in greater detail; “Mr Deberle rapidly realised that his high requirements closely matched the standards that apply in the field of medical technology.”

A complete machining strategy allowed Kroeplin to reduce processing time and costs by at least 30% across the board.



Markus Deberle, Managing Director of Kroeplin GmbH in Schlüchtern: “Since both of the Bumotec s191 machining centres operate with a Fanuc 34i controller, we’ve been able to use our existing programs for the new machine; there’s been no need for a new post processor or for any retraining of the operators.”



The company does not cool the machine from the exterior; instead, it selectively dissipates the heat within its interior.

“We can use the machine to manufacture extremely complex parts with a geometry that would overwhelm the capacities of other machines”



Specialist Julius Graubner programmes the machining of a component on the Fanuc controller.

The tiny probe was previously manufactured using three different machines and manual work. A complete machining strategy allowed Kroeplin to reduce processing time and costs by at least 30% across the board. Deberle points out another added bonus, “We can use the machine to manufacture extremely complex parts with a geometry that would overwhelm the capacities of other machines.” To his surprise, he rapidly also discovered that the machine was very popular among his designers, since it gave them more freedom to develop significantly more complex components. “We’ve learnt something new with every new part”, says the Managing Director. “And that has meant a steady increase in the volume of orders”.

Both the first machine and the second machine that was acquired at a later date are remarkable for the number of extra features they incorporate. Deberle opted for an identical setup with his second machine, since he wanted to leverage the full potential available once again. And so his order included linear-driven Y and Z-axes, turning and milling functions, a counter spindle A, an extension allowing the tool magazine to hold 90 tools, a pneumatic bar feeding system and interfaces with the FMB bar feeders, enabling fully automated operation during unmanned shifts. Extra features include fire extinguishing equipment for both machines. According to Paulus; “This is mandatory in the EU if you’re machining parts during unmanned shifts using oil as a coolant”.

“The Bumotec means that we can mill a finished stainless steel component from a single piece of stainless steel bar, even during an unmanned shift, without the need for any manual labour at all.”

Markus Deberle

One of the reasons for purchasing a second s191 was to incorporate a certain level of redundancy into the company's processes. The strategy of using at least two machines with the same equipment, so that one can easily take over the work of the other, has proved a success. In some cases, the machines are not even located in the same country; for example, we operate identical turning machines with a main spindle and a counter spindle and a tool turret in both Schlüchtern and Mariánské Lázně. In the words of the Managing Director, “Now we're applying the same approach with the Bumotec s191 – if one machine fails, the other can still continue manufacturing parts. Since both operate with a Fanuc 34i controller, we've been able to use our existing programs for the new machine; there's

been no need for a new post processor or for any retraining of the operators”

An additional factor in the decision was that the first Bumotec s191 was being operated for 7,200 hours per year, which was an excessive utilisation rate given that the total number of operating hours in a year is only around 8,000. “There was hardly any time left for maintenance and servicing”, says Deberle. “The number of parts manufactured using this machine has increased yet further, because our designers are taking advantage of the freedom available to them to work on more complex parts”.

The order confirmation for the second Bumotec s191 contains one very important sentence; “The ideal ambient

temperature is between 18 and 22 degrees Celsius”. Kroeplin complies with this specification not by means of an expensive air-conditioning system, but by using a smarter solution that saves money and protects the environment. According to Deberle, “We don't cool the machine from the exterior; instead, we selectively dissipate the heat within its interior”.

Whenever we investigate a Starrag success story, there's always one key question we ask; to what extent does the Starrag machine deliver on our claim of “Engineering precisely what you value”? Deberle doesn't have any facts and figures to hand, but he could not be happier with his twin team of machines. He says that another point



Direct access to the tool magazine with its 30 tool pockets guarantees rapid retooling.

in favour of the 'team of two' is the close relationship that has formed between Volker Lorenz, the main operator and programmer and Jan Wolf, from Bumotec Service, who always provides rapid and expert responses to any queries. And what does a managing director dream about achieving in the future, when he has already achieved so much in the past? Deberle fires back an answer straight away, without needing any time to think about it, "A robot carrying out fully automated measurements with a Kroeplin measuring instrument in its hand". There seems little doubt that the improved measuring contact tips that would be required for this purpose will still be manufactured in a clamping device on one of the two Bumotec machines. ▽

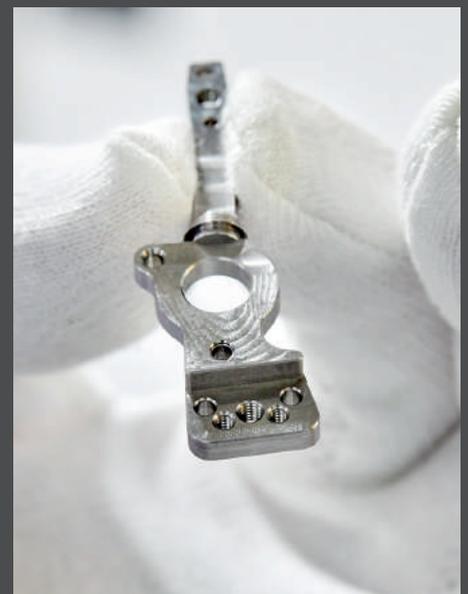


Nowadays, every second Kroeplin manual probe is equipped with microelectronics. The technology is so popular that even global market leaders in measurement technology offer Kroeplin dimension measurement technology under their own brand names.



Michael Paulus, Regional Sales Manager at TechCenter Immendingen, in discussion with Markus Deberle, Managing Director of Kroeplin: "Mr Deberle rapidly realised that his high requirements closely matched the standards that apply in the field of medical technology."

The measuring contact tip of a tiny electronic probe arm is one of the reasons why Kroeplin needed a second Bumotec.



An unique achievement – 600 Bumotec s191 machines sold

The assets of the Bumotec s191 – a new benchmark in ease of use

It is extremely rare in the world of machine-tools for such a high number of machines to be sold. The s191 is a special case; it adapts to any environment and is a unique model whose versatility makes it the Swiss army knife of machining centres.

Can you give me your personal definition?

Guy Ballif: Olivier Conne, CEO of Del West, you have renamed it the “dancer”...

Olivier Conne: Yes! On numerous occasions, I have referred to the Bumotec s191 as the “dancer” because its counter-spindle performs movements with the greatest elegance; it is both beautiful and high-precision.

Guy Ballif: Seriously though, I often say that the Bumotec s191 is a real Swiss army knife. Just like the iconic tool with a variety of functions, the s191 is, all in all, an excellent base which can be easily adapted and even adjusted to the customer’s specific requirements. It all starts with a relatively simple machining centre which can machine bracelet links or other prismatic industrial workpieces from bars, right up to a complete machine equipped with a counter-spindle, an integrated automation system and even the possibility of grinding, enabling the user to produce parts from ceramic, hard metal and even synthetic materials, thanks to a combination of conventional milling and grinding operations. This platform covers a vast range of customer requirements. And the versatility of this machine is proven by the large number of centres in the machine inventory: over 600 s191 models are installed and in service worldwide! It’s sufficiently rare to be of note, and something to be proud of. The greatest assets of this model are its precision and its thermal stability. So it is great to have a machine that is ready for use within a few minutes of being

The sale of the 600th s191 machine gave the editors the opportunity to meet with the following individuals at Del West’s premises, the company who purchased this legendary s191:

Olivier Conne, CEO of Del West Europe in Roche, the buyer of the machine
Jean-Daniel Isoz, Director of Starrag Vuadens SA
Guy Ballif, Luxury Goods Segment Manager at Starrag Vuadens SA
Stéphane Violante, International Marketing Manager at Starrag Vuadens SA



Manufacturing facility – Starrag Vuadens SA in Vuadens.

switched on, that is capable of producing workpieces with exact dimensions right from the first draft. A machine which has an excellent reputation as much for its repeatability as for its reliability. In almost 15 years of existence, the s191 has never been transformed, but numerous changes have turned it into a real benchmark for “mill-turn” machines. It is also renowned for being very easy to use.

Why are you inaugurating the 600th s191 machine sold? Is it because sales of this machine model are beginning to drop?

Stéphane Violante: Quite the opposite actually, year on year, sales of this model continue to increase. To hit the six hundredth machine sold means that it

has proven itself on the market and continues to meet a real need. Despite the fact that this need is changing, the s191 continues to be able to respond without any trouble. 600 machines installed and in service, it’s an event in itself. It should be noted that the first centre installed still performs extremely well; it is therefore a flagship product which has definitely proven itself, and this guarantees the longevity of this machine.

Guy Ballif: In fact, for a customer, what more of a guarantee of stability and maturity is there than the knowledge that there are already so many machines of the same model all operating problem-free. Hence, the associated risks are minimized, something our customers really appreciate.

Jean-Daniel Isoz: It is important to remember that we, just like most other Swiss machine manufacturers probably, do not design machines with the single primary objective of achieving the greatest sales volume possible. Selling 600 Bumotec s191 models was never the primary objective during the design stage. However, just like the Swiss army knife, building an architecture produced on a basic model makes sense. This is demonstrated by its commercial success.

At Del West, your slogan is “Born to Innovate”. In what way do you think that buying this machine will enable you to innovate in your production?

Olivier Conne: In order to guarantee maximum freedom of innovation for our products, we endeavor to integrate the latest-generation production equipment which is highly accurate and flexible.

The ability to combine machining and grinding operations on the same terminal is a real asset, like the linear axes.

Guy Ballif: Thanks to this new way of using the s191 at Del West, we can add blades to our “Swiss army knife” particularly by machining exotic materials!

Olivier Conne: Yes, we use the materials of tomorrow to innovate. These materials are often difficult to shape. Moreover, Del West has developed extensive knowledge of producing components from materials known to be difficult or even impossible to machine.

And a rather awkward question ... Why did you choose a Bumotec machine?

Olivier Conne: Our industrial strategy focuses on buying machines with

excellent durability and advanced technology. Back in 2011, we made our decision to buy our first Bumotec to produce the middle parts of watches. It wasn't the cheapest but its quality was obvious. We also wanted to ensure that we were fairly geographically close to the supplier, particularly as the machines are so sophisticated.

Guy Ballif: Don't forget that in 2010, the s191 was a pioneer, mainly because it offered bar machining and was equipped with linear motors. We were trailblazers.

It is relatively rare in the world of machine-tools to see a machine survive so long; can you talk about the history of the improvements?

Guy Ballif: The greatest development was being able to work using bars. Then, working with blanks, we incorporated an automation system from an A4 size



It is extremely rare in the world of machine-tools for such a high number of machines to be sold. The s191 is a special case; it adapts to any environment and is a unique model whose versatility makes it the Swiss army knife of machining centres.



“What is great is that Del West works in another sector, unrelated to watchmaking, which leads to other ways of thinking and other uses of the s191.” Guy Ballif, Luxury Goods Segment Manager at Starrag Vuadens SA

“A remarkable machine which has proven itself.”

plate, up to 50 workpieces per plate and a maximum total of 20 plates, developed recently. This improvement became possible around 2010–2011.

Jean-Daniel Isoz: Today, this machining centre equipped with its automation is extremely competitive in terms of price per workpiece. It is simple to use and does not require any particular skills in robotics.

In the spring of 2016, we noticed that the s181 was more precise and more compact than the s191 but, despite this, it still continued to sell ...

Guy Ballif: Yes, because the s181 has two stations which work simultaneously. The s181 model has the advantage of working the 6th face in concurrent operation time. The s191 model cannot

do this, but instead, offers a broader range of possible configurations and enables a greater variety of workpieces to be produced.

Has the s191 model been bought to replace another machine, increase production flexibility or to create a new production line?

Olivier Conne: To purchase a multiple platform solution combining turning and milling to facilitate greater flexibility. We currently have three of these models.

Is your strategy to favor local investments or, conversely, do you choose performance at the best price?

Olivier Conne: We buy from what we consider to be the best suppliers; if they are based in Switzerland, we appreciate it very much.

Are environmental parameters such as power requirements, oil filtering, lubricant recovery, involved when choosing a machine?

Olivier Conne: Not so much today, but that will quickly change. Our customers ask us this type of question and these elements will naturally be included in the selection criteria when future purchases are made.

If the customer, in exchange for purchasing a new s191, (or purchasing another new machine), “offered” you an old machine to take back, would you do it?

Guy Ballif: This rarely happens. On the market, there are no second-hand Bumotec machines.

“Very often customers purchase our machines because of the guaranteed support during use.”

Jean-Daniel Isoz, Director of Starrag Vuadens SA

Jean-Daniel Isoz: We do retrofits on a case-by-case basis, but it is not our “core business”.

And in terms of tooling, which is very important in machining, how do you decide?

Olivier Conne: We have Capto tool holders. It wasn't initially simple but it has turned out to be a good choice. As for cutting tools, we test a lot of tools and we have developed considerable skills in selecting tools. Bumotec is always full of advice. Bumotec's After-Sales service is excellent, as is the Sales Department.

What are your thoughts about the new Innoteq trade show in Bern being held in March 2021?

Jean-Daniel Isoz: I prefer smaller exhibitions targeted at specific markets/regions, as the era of general trade fairs is long gone.

Guy Ballif: It is true that by expanding the opportunities to exhibit products, there is a tendency to put off customers. We gave up on Prodex, as it was becoming too generalist. We prefer our showroom to prove our expertise; it is particularly important to demonstrate our synergies between SIP and Bumotec. Since these two entities have come together, we can offer our customers greater reliability and added value.

How will the new s191 be used by Del West?

Olivier Conne: The machines are not specialist machines; they remain flexible to ensure maximum adaptability. With the latest s191, we can produce prismatic workpieces, such as bracelet attachments, crown guards, clasps or gearbox parts for racing cars. Our strength is knowing how to machine a multitude of materials such as stainless steel, titanium and aluminium alloys, as well as more exotic materials such as very special steels or even metal matrix or carbon composites. ▾



The s191 is a complete machining solution making it possible to work with bars (Ø32/50/65 mm) or blanks, rapid linear axes and a spindle reaching 30,000 rpm in under 2 seconds, a total of 7 axes, 3 spindles and 90 tools – in short, the Holy Grail.

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Berthiez
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Let's discuss how to generate
optimised benefits through
applications focused machining!

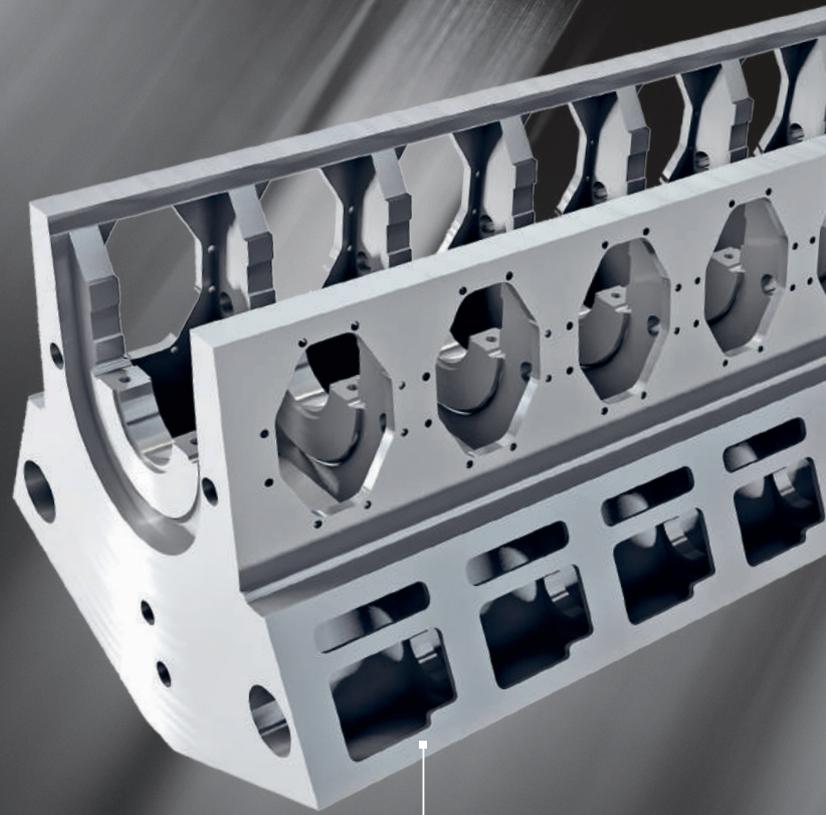
**For components
from 1 g to 200 t!**



<1 g



>1200 kg



>150 t

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