WALDRICH SIEGEN Journal

2026



ProfiTurn H

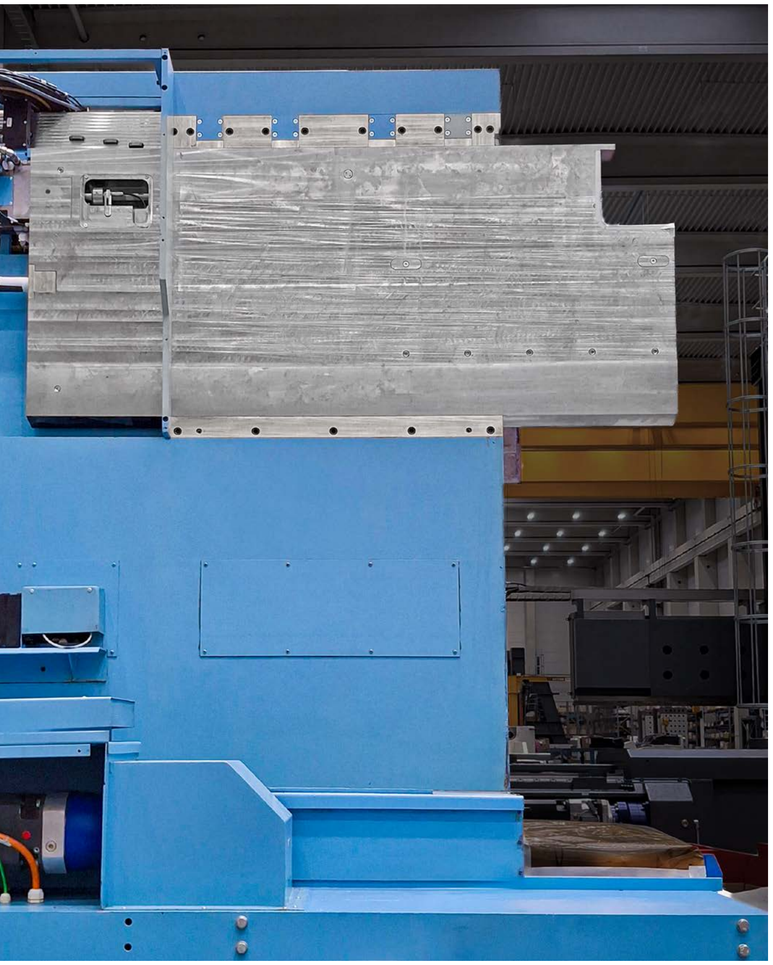
For maximum precision in the machining of large components

Success Stories from Around the World

Customized solutions for the steel, energy, and defense industries

HQ 5 Roll Hardness Measurement System

Non-destructive hardness testing, fully automatic and on the fly



Large turbines are key components in power generation at gas, nuclear, hydroelectric, and steam power plants, as well as in the power supply for AI data centers. High-precision turbine rotors, generator shafts, and stators are particularly critical, as they must meet the highest standards for performance, reliability, and service life. These key components enable the efficient conversion of mechanical energy into electrical energy, thereby making a significant contribution to a safe, high-performance, and sustainable energy infrastructure.

Making Highly Efficient Use of Existing Resources

Modernizing Existing Machines for Consistent, Top-Quality Results

Machining large turbines places the highest demands on machine tools. To remain competitive in this demanding industry, a long-standing customer from France is once again relying on the quality and performance of WaldrichSiegen. The market leader in the manufacture of steam turbines for heat and power generation has commissioned a complete modernization of a ProfiTurn H 4500/350 horizontal turning lathe previously installed in the U.S.

Upgrading an existing machine often represents an economically and technically sound alternative to purchasing a new one. By retrofitting the machine with the latest control, drive, or safety technology, the performance of the existing system can be significantly increased without having to bear the high investment costs of a new machine. At the same time, downtime is reduced, existing resources continue to be utilized, and the machine's service life is significantly extended.

"Machining turbine components on a horizontal turning lathe involves far more than just precise turning," explains Stefan Tschersche, a Member of the Executive Board at WaldrichSiegen. "The components – such as turbine rotors or housing parts – are large, heavy, and must be manufactured with extreme precision because they will later operate at high speeds and temperatures."

The machine is therefore equipped with hydrostatic guides on all machine axes and excellent damping properties, which are helpful for heavy-duty machining on the one hand and, on the other, enable wear-free guidance that ensures precise machining of workpieces with diameters of up to 4,500 mm, weights of up to 350 t, and lengths of up to 20,000 mm for decades to come.

"By upgrading to the latest Siemens control technology Sinumerik ONE, as well as by installing an additional tool carrier on the tailstock side and adding another pair of tool post tops, the customer is greatly expanding its production capabilities and providing a state-of-the-art machine for the coming decades," concludes Stefan Tschersche.

Perfect Complete Machining with the Tightest Form and Position Tolerances

Maximum Precision for Large Components in Power Generation

The horizontal turning lathes of the ProfiTurn H-series offer ideal conditions for machining large turbines: Even with workpiece weights of several hundred tons, their hydrostatic guides and bearings ensure maximum precision, high rigidity, and excellent vibration damping. This enables turbine rotors and generator shafts to be manufactured with high precision and process reliability.

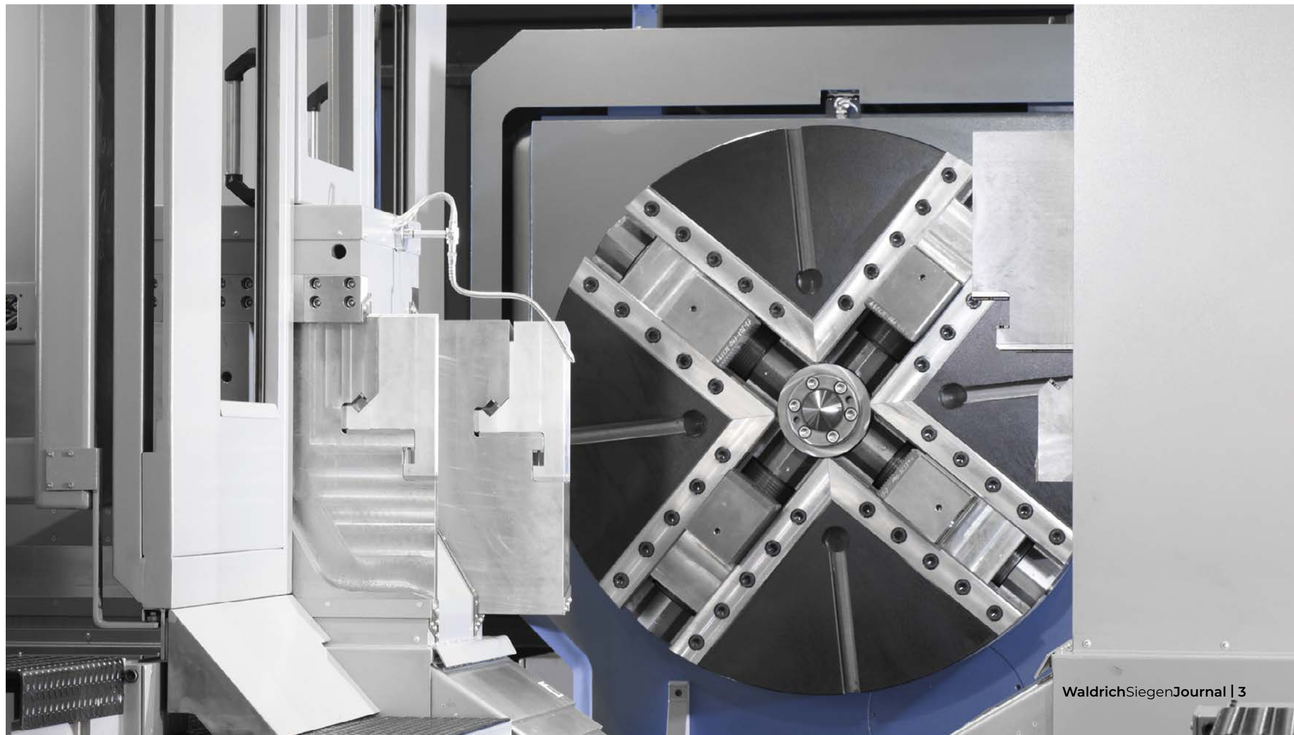
"The three ProfiTurn H 3500/180-M machines are used by our customer GE Birr for the complete machining of turbine core components for power generation. In this context, it is crucial to adhere to the very tight form and position tolerances of ≤ 0.005 mm while simultaneously achieving high cutting rates with excellent vibration damping and minimal thermal runout," explains Sales and Project Manager Alexander Pieler. "This is particularly important because the customer machines workpieces with diameters of up to 3,500 mm, center distances of up to 19,000 mm, and weights of up to 180 t."

The design of our machine's main components is the basis for consistently precise machining. The high-precision-machined and assembled structures – such as the three-piece machine bed with a thermosymmetrical gantry – are designed to minimize the impact of temperature changes and cutting forces on the machine's accuracy. "With standard columns, one side can heat up more than the other. This causes the column to deform, and the tool center point can shift slightly, leading to geometric and dimensional errors," Alexander Pieler explains.

"Therefore, the thermosymmetrical gantry frame is designed to distribute heat and forces as evenly and symmetrically as possible. This ensures that the tool's position remains more precise, even when heated and under the influence of high cutting forces."

The 3-point measuring system developed by WaldrichSiegen further supports the highly precise measurement of the workpiece's position and orientation. Technologically, the system is based on the proven C-frame three-point measuring device and was further developed for the automated measurement of large turbine components. "Deviations in diameter, shape, eccentricity, roundness, concentricity, and taper, as well as workpiece deflection, can thus be reliably detected and compensated. The automatic measurement of turbine rotors and compensation for workpiece deflection in conjunction with the hydrostatic steady rests is unique worldwide. Manual measuring tools are no longer needed, and process reliability and dimensional accuracy are thereby greatly enhanced – ensuring precise and reproducible results on every machining cycle," explains Alexander Pieler.

The manufacturing concept, perfectly tailored to the customer's needs and featuring a very high degree of automation, technology, and long-term accuracy, reduces setup and production times significantly. "The use of state-of-the-art process monitoring software and intelligent sensor and camera systems increases transparency and reliability throughout the entire machining process. Process deviations are detected early, unplanned machine downtime is minimized, and production quality is consistently ensured," says Alexander Pieler. "At the same time, our customer benefits from higher machine availability and more cost-effective production – crucial advantages when machining complex and large components."





Machine tool manufacturing is one of the key sectors of industrial mechanical engineering and forms the foundation of modern manufacturing processes. High precision, productivity, flexibility, and innovative technologies are particularly important in this context to meet the growing demands for quality, efficiency, and automation.

Technological Excellence in Demanding Industries

Using Knowledge and Experience to Deliver Tailored, Comprehensive Solutions

Our long-standing customer, J.M. Voith SE & Co. KG | VTA, who has relied on WaldrichSiegen's large machine tools for decades to manufacture a wide range of products, including gearboxes, couplings, and flange drivers, has once again invested in a machine from the market leader and purchased a KCR 130 DT hydrostatic boring mill in a dual-table configuration to expand its production capacity.

The very wide range of different workpieces to be machined by the customer requires an enormous amount of knowledge and experience in the areas of application, technology, automation, and process monitoring. In addition to adhering to tight form and position tolerances of up to 5 µm and the high basic accuracy of the machine design required for this, the technological equipment plays a particularly crucial role.

"With this project, we were once again able to demonstrate our market leadership in the field of Industry 4.0 and technological excellence," says Sales and Project Manager Alexander Pieler. "Together with Siemens, we created a digital twin of the machine in advance.

Digital machining preparation makes it possible to simulate and optimize processes in advance. Combined with rapid fault diagnosis, preventive measures, and predictive maintenance, this creates a comprehensive digital concept for maximum process reliability and machine availability – all under realistic conditions.

This allowed us to identify errors early on, shorten development times, and drastically reduce costs. At the same time, the digital twin enables better planning, optimization, and commissioning, which was particularly important here since the machine had to be perfectly fitted into the very limited installation space of just 20 x 12 x 6 m," explains Alexander Pieler.

In addition to the latest Siemens Sinumerik ONE machine control system, the machine features workpiece measurement via a radio-controlled probe as well as high-precision laser tool measurement. "This intelligent large-scale machining center will replace two existing machines in the customer's large-part production," explains Alexander Pieler. "Here, too, WaldrichSiegen has once again demonstrated that we can offer a manufacturing concept optimally tailored to the customer's needs, featuring a very high degree of automation, technology, and long-term accuracy," says Alexander Pieler.

The machine is of central importance to the customer's production. "The complete machining of the components requires a machine with high cutting performance, high rigidity of the entire system, excellent damping, and the ability to maintain high long-term accuracy in order to meet the specified requirements," Alexander Pieler continues.

"The boring mill impresses with the very high basic accuracies of all its main components. Combined with load-dependent hydrostatic control and temperature regulation of the coolant and hydrostatic oil across all axes, friction is virtually eliminated, enabling particularly smooth and low-wear motion. At the same time, high machining forces can be safely absorbed without significantly compromising positioning accuracy," explains Alexander Pieler. "This ensures high positioning accuracy, repeatability, and precision and contributes significantly to consistent machining quality – an important foundation for high-performance and precise boring mills, especially when machining large and heavy workpieces."



Setting the Standard – Today and Tomorrow

Continuous Investment, Sustainable Competitiveness

In a highly competitive international market, reliability, cost-effectiveness, and continuous development play a decisive role in remaining competitive as a manufacturer of high-precision machine tools. That is why a new Chinese customer – an established manufacturer of gear hobbing machines and precision equipment for the automotive and transmission industries – relies on the quality of WaldrichSiegen and is expanding its machine fleet with a ProfiMill 4500/79-T.

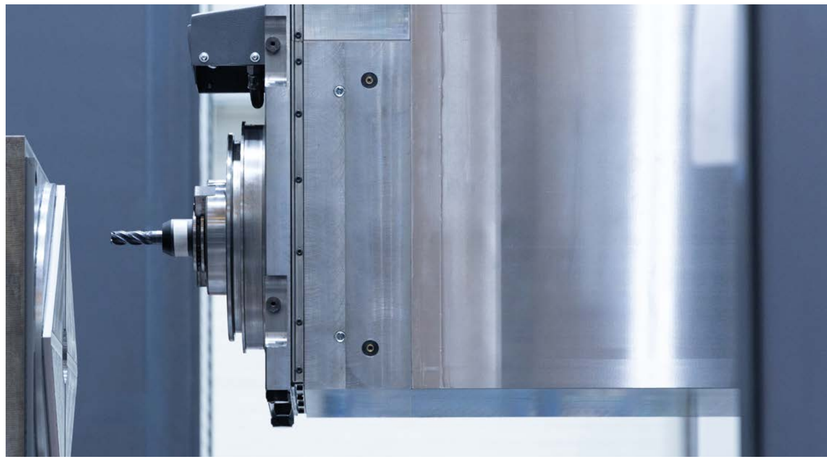
"The machine is used both for machining large components and for manufacturing the most demanding precision parts," explains Rongbin Chen, Sales and Project Manager. "Among the greatest challenges are the high accuracy requirements, adherence to the specified tolerances, and achieving consistent surface quality with every machining pass. With its rigid machine structure, hydrostatic guidance on all axes and flexible machining concept, the ProfiMill 4500/79-T provides the accuracy and process stability required across the customer's broad range of components."

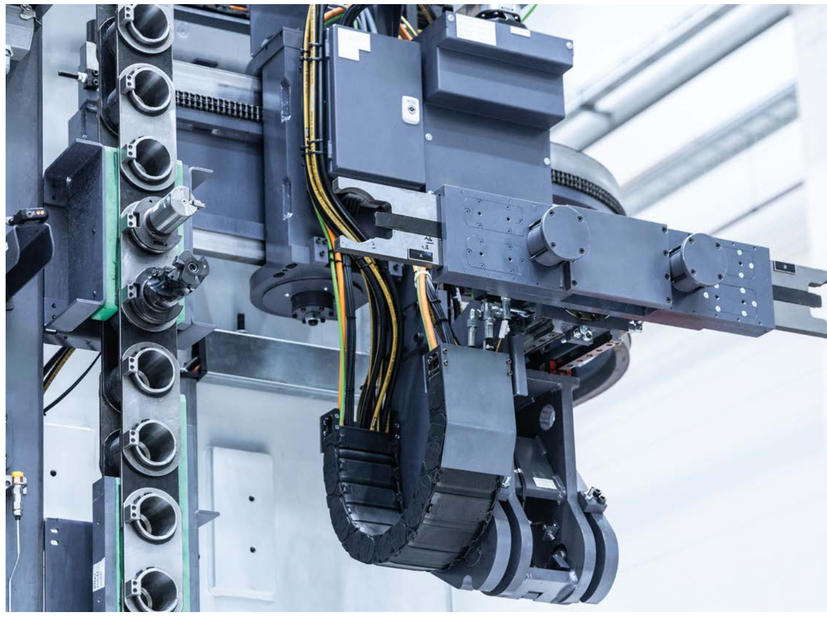
The unique Master-Head concept enables particularly flexible and cost-effective production. Thanks to the standardized base system, different machining heads can be quickly changed, allowing the machine to be optimally adapted to various applications.

This reduces setup times, increases productivity, and effectively lowers investment costs, as all machining tasks can be performed with a single machine. At the same time, the customer benefits from greater process reliability, simplified maintenance, and improved scalability of manufacturing processes.

The steel industry is characterized above all by its enormous versatility – both in terms of products and machining tasks. The resulting wide range of workpieces that need to be machined poses major challenges for many manufacturers in terms of achieving the highest surface finishes, precision, and durability.







Expertise Starts with Trust

Comprehensive Service and Top-Quality Machinery

Hydrostatic boring mills offer a particularly efficient and precise manufacturing solution for applications requiring high machining rates. Companies benefit from increased process reliability, longer tool life, and outstanding overall system performance.

Our long-standing customer, Salzgitter Flachstahl GmbH – a renowned manufacturer of hot-rolled wide strip, steel strip, and cold-rolled fine sheet metal – has therefore decided to equip its steel mill with another machine from WaldrichSiegen. With this decision, the company is continuing its successful and long-standing partnership and underscoring its confidence in our technologies and solutions: With a spindle diameter of 162 mm and travel ranges of 6,000 mm on the X-axis, 2,500 mm in the Y-axis, and 1,100 mm in the Z-axis, the PCR II 162 hydrostatic boring mill enables the machining of large and complex workpieces. The extendable boring spindle also allows for machining inside the workpiece with a plunge depth of up to 750 mm (W-axis).

“The boring mill is additionally equipped with a rotary sliding table for machining workpieces with a maximum weight of 45 t and a clamping surface of 2,000 × 3,000 mm. The high performance, combined with the enormous rigidity of the machine’s structural design, enables the heavy-duty machining required by the customer,” explains Sales and Project Manager Alexander Pieler.

Thanks to the chain magazine with a total of 60 slots and a pick-up station, different tools and milling heads can be changed quickly and safely.

Another challenge was the existing space constraints into which the machine had to be fitted. “The machine layout was specifically adapted to the restricted installation space, allowing the customer to integrate the new capacity into the existing production environment without compromising machine performance,” Alexander Pieler says.

In the production of thin metal strips or sheets in cold rolling mills, high-performance roll grinding machines are indispensable; they ensure high concentricity and geometric accuracy of the rolls being machined, precise grinding profiles, and a very fine surface finish.

Fast Processes. Higher Quality. Sustainable Success.

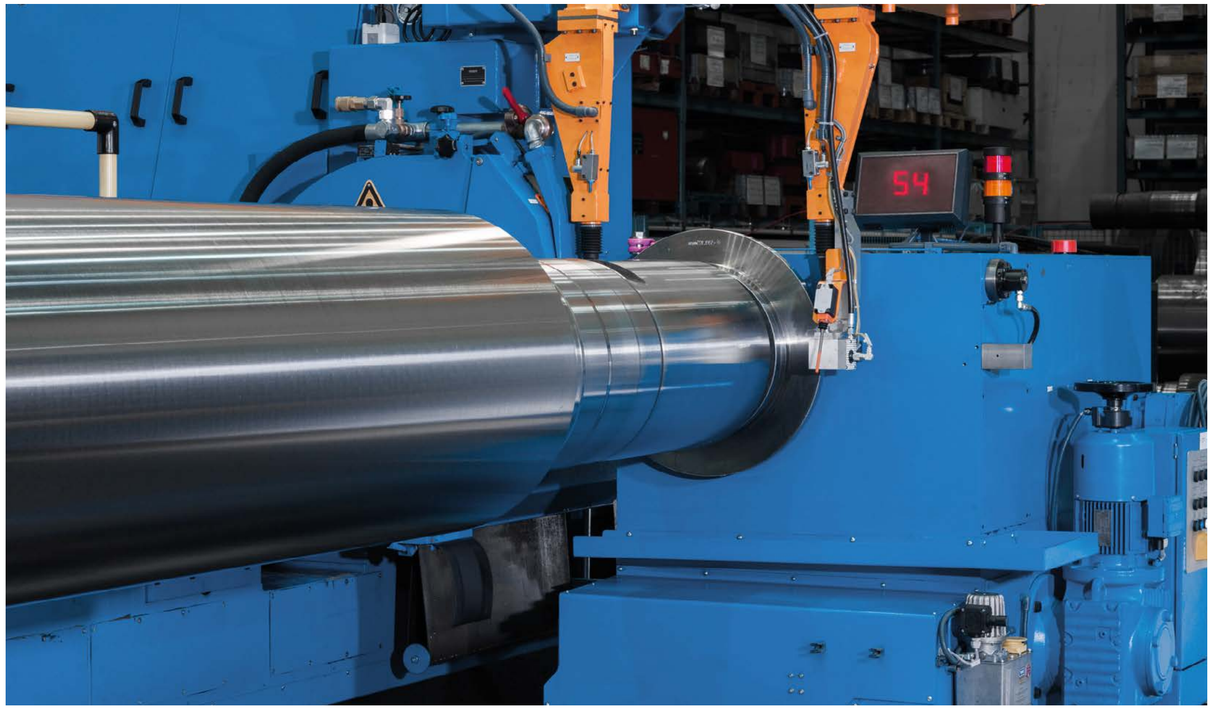
Quality Starts with the Right Machine

Tangshan Yongfeng Roll Co., Ltd. is a renowned manufacturer of cast rolls based in Tangshan. The company has undergone rapid growth in recent years and has become one of the leading companies in the Chinese steel sector.

To reliably ensure the high surface finishes, profile accuracy, and concentricity of the customer rolls it produces, the company decided to invest in the quality and reliability of the global market leader and purchased a ProfiGrind 8000 roll grinding machine. It will machine rolls weighing up to 80 t and measuring up to 12,000 mm in length.

“The decision to choose WaldrichSiegen was based primarily on the fact that we can achieve the required tolerances and accuracies of ±0.002 mm in roundness and form,” explains Boldoo Bao, Sales and Project Manager. “Reliably achieving and consistently maintaining the required accuracies are among the decisive factors in this project. The ProfiGrind machine concept is designed to maintain these demanding tolerances reliably and consistently in production.”

The ProfiGrind will significantly expand the plant’s capacity and, in the long term, help ensure that future specifications are optimally met. “The customer plans to further expand its production capacity and has expressed interest in a ProfiTurn H-series turning and milling machine so that it can also produce crankshafts, large crankshafts, and eccentric shafts in the future,” says Boldoo Bao. “The horizontal lathes in WaldrichSiegen’s ProfiTurn H-series are the ideal solution for the precise and efficient machining of rotationally symmetrical workpieces with diameters up to 7,000 mm, 30,000 mm in length, and 500 t in weight.”



Manufacturing turbine drives, marine engines, propeller shafts, and generators for propulsion technologies requires precise, powerful, and reliable machine tools – both for finishing operations and heavy-duty machining – to ensure maximum flexibility across a wide range of manufacturing processes.



Precision Meets Peak Performance

Achieving Market Leadership with Machines from WaldrichSiegen

By investing in two new machines from the ProfiTurn H-series, a Chinese manufacturer of key components for marine engines and offshore installations is relying on the performance, reliability, and quality of WaldrichSiegen to further optimize its manufacturing processes.

“In an increasingly globalized competitive environment, technological innovations and efficient production processes are becoming more and more important for securing and expanding market leadership in the long term,” explains Frank Pyrdok, responsible Sales and Project Manager. “By investing in two crankshaft lathes from the ProfiTurn H-series, the customer is significantly increasing production capacity at its plant and is poised to become a global market leader in this segment over the long term.”

Designed to machine up to seven different crankshaft types on a single platform, the two machines combine the rigidity required for heavy-duty cutting with the flexibility needed for changing production demands. “They enable high-precision machining of up to seven different crankshaft types – particularly heavy-duty crankshafts for marine diesel engines – including the complex machining of main and connecting rod journals,” says Frank Pyrdok. “Thanks to the highly rigid machine design and the hydrostatic guides, precision specifications are reliably met.”

The unique selling point of both machines is the so-called “Pin Turner” or automatic connecting rod journal turning machine. “The Pin Turner enables the machining of areas whose axis is not identical to the main axis of the shaft. This allows connecting rod and bearing journals on very large crankshafts to be machined without having to go to the trouble of re-clamping the entire workpiece,” says Frank Pyrdok. Thanks to the Pin Turner’s fully automatic diameter adjustment and the semi-automatically adjustable steady rests, our customer can achieve maximum flexibility and high-efficiency machining of a wide variety of workpiece geometries with short setup times and consistently high machining quality.

Further Increasing Production Capacity

Consistent Performance, High Reliability

Another Chinese customer, Dalian Huarui Heavy Industry International Co., Ltd., has also relied on the expertise and reliability of our crankshaft lathes for nearly 20 years and has now expanded its machine fleet, consisting of four ProfiTurn H machines, with an additional ProfiTurn H 5000/120-C-50 x 18,000-1.

“A decisive factor in this repeat purchase was the consistent performance, reliability, and stable accuracy in machining large two-stroke crankshafts, including main journal pins, connecting rod journal pins, and associated components that require high precision and surface quality,” explains Rongbin Chen, Sales and Project Manager. “Crankshaft machining is characterized by complex geometries, eccentric structures, and extreme precision requirements,” Rongbin Chen continues. “These include maintaining precision during heavy-duty machining, ensuring stability during eccentric machining, and achieving consistent surface quality. Thanks to its rigid machine design, powerful drive system, and advanced control and programming, the machine masters all these challenges with ease.”

The machine is a central component of crankshaft machining. It guarantees process reliability and production efficiency and ensures consistent quality in critical engine components. It will machine up to 12 different workpiece types with turning diameters of up to 5,000 mm, lengths of up to 18,000 mm, and maximum weights of up to 350 t.

Leading in Precision and Technology

The HQ 5 Roll Hardness Measurement System

A roll's hardness profile is a critical quality parameter and significantly influences both the quality of the end product and the roll's service life.

If the roll does not have the appropriate hardness – especially at its center – it can lead to handling damage and out-of-roundness. If the roll is too hard, it can result in sagging and spalling. Therefore, it is essential to determine the optimal average hardness level to prevent material damage to the roll.

In this interview, Harald Kraft, Senior Director Electronics of our HerkulesGroup team of specialists in state-of-the-art measurement and testing systems, introduces the innovative, fully automatic, non-contact, and therefore non-destructive hardness measurement system HQ 5.



> The benefits for our customers are clear: Grinding is reduced, and the highest possible surface homogeneity is achieved. This also translates into a direct cost advantage, as the roll's service life is significantly extended and process reliability within the stand is better ensured.
>
> Harald Kraft, M.Eng., Senior Director of Electronics at HerkulesGroup



Mr. Kraft, which hardness measurement methods are typically used for roll barrels?

In roll shops, measuring devices based on the Leeb method are most commonly used. The operating principle is that an impact body strikes the roll surface with a defined amount of energy. The ratio of impact velocity to rebound velocity is then measured. The hardness of the roll is calculated from the resulting energy loss. The problem with this measurement method is that it always creates small indentations on the roll, meaning the surface is damaged at the points where the impact body strikes.

Our measurement method, on the other hand, is non-contact and therefore completely non-destructive. It is directly integrated into the control system of our roll grinding machines and takes place during the grinding process – we therefore consider this a milestone in the field of hardness measurement.

How does our method differ from that of the competition?

In our measurement method, we utilize Barkhausen noise. This is a type of magnetic noise that is used to non-destructively assess the material properties of ferromagnetic materials. This highly sensitive method for quality and condition testing of rolls is a true innovation on the market, as it increases operational reliability and reduces costs over the roll's entire life cycle.

How does the measurement principle work?

We use a core wrapped in a coil. This U-shaped iron core generates an alternating magnetic field, causing the micromagnets in the roll's surface to align in a common direction. This generates Barkhausen noise. The greater the noise, the softer the material.

The raw values determined by our system are converted into absolute hardness readings through a calibration process.

Why did we choose QASS as our partner?

We conducted extensive and very thorough research in advance to find a manufacturer who not only offers this measurement method but can also implement it in collaboration with us in a way that meets the requirements of Industry 4.0 regarding the intelligent networking of machines and sensor technology. We now present this specialized measurement method to our customers in a data-driven and transparent manner.

Were there any technical challenges during development – and how were they resolved?

A key factor is the design of the measuring head. To this end, we tested several designs on various test rolls at our facility in Ford City, USA. Measurements were then taken on our test bench to determine where modifications were needed.

In the process, we discovered that the amplifier that injects the signal into the roll must be significantly more powerful than we had previously assumed. Accordingly, the measuring head and amplifier were redesigned and optimized to ensure that a flawless and carefully calibrated signal is transmitted, thereby delivering reliable results.



Is the HQ 5 hardness measurement system a standalone system, or does it operate on the fly?

The measurement process also runs concurrently with the grinding operation, continuously measuring and monitoring hardness so that any soft or hard spots can be detected and ground away until the hardness differences are evened out and the roll surface is uniformly machined.

Why is hardness measurement so important for rolls?

Rolls are the most important tool in the mill, as they directly determine forming, quality, and process stability. Hardness directly influences the roll's wear behavior, service life, and product quality. Hardness measurement is therefore a critical process.

Insufficient hardness leads to increased wear and deformation, while excessive or non-uniform hardness increases the risk of cracks, spalling, and surface damage. Until now, hardness was often checked only sporadically or based on existing empirical values – but there was no precise information or data available. The actual hardness is therefore one of the last unresolved parameters for mill operators.

Thanks to our optimized HQ 5 hardness testing system, developed in collaboration with QASS, our customers can now access all roll parameters – ensuring maximum transparency, well-informed process decisions, and a comprehensive data foundation.

How does our system document the measurement results so that they are traceable and audit-ready?

Thanks to our internally developed roll grinding machine control system, which stores the hardness measurement data in chronological order after each stroke and makes it accessible at any time, all measured values are logged.

Consequently, the user has access to a complete history of all measurements taken during the grinding process as well as all data collected prior to grinding.

Thank you very much.

Revolutionary Hardness Testing Using Micromagnetic Technology. Find out more:

The machining of complex components for the defense industry places high demands on manufacturing. In addition to cost-effectiveness and productivity, the focus is particularly on uncompromising precision, maximum process reliability, and the tightest manufacturing tolerances – to ensure consistently high component quality.
The optimal solution for machining such workpieces for the defense sector is the use of gantry milling machines.
Crucial factors here are first-class machining accuracy for large-format components and high machine rigidity to achieve low-vibration machining conditions.



Where Precision Ensures Safety

Performance You Can Count On

Our South Korean customer, Hyundai Rotem Company – a manufacturer of products for the defense industry – has decided to invest in a ProfiMill 5500/103-T gantry milling machine to reliably machine demanding materials for safety-critical components in the defense sector.

“Compliance with the required dimensional and quality specifications for military vehicle components is of critical importance, as it directly affects the safety and reliability of the vehicles. Even minor dimensional deviations can lead to problems with the assembly and functionality of tracked vehicles,” explains Frank Pyrdok, responsible Sales and Project Manager. “In particular, safety-critical components such as bogies, axle housing bearings, or chassis components must be manufactured with high precision to ensure the operational safety of the vehicles as well as a high level of reliability.”

Since tracked vehicles are often in service for several decades in difficult terrain, high manufacturing quality is an essential prerequisite for safe and reliable operation throughout the vehicle’s entire life cycle.

The ProfiMill 5500/103-T impresses with throughput widths of up to 5,500 mm, throughput heights of 4,000 mm, and a table size of up to 4,500 x 12,000 mm. “The possibilities offered by the machine’s enormous dimensions – allowing it to machine both small and particularly large workpieces – have completely convinced the customer,” says Frank Pyrdok.

“The machine concept combines cost-effective machining with the precision required for safety-critical components. Another advantage was the ability to fit the machine into a very limited installation space specified by the customer thanks to our custom-designed solution,” concludes Frank Pyrdok.

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