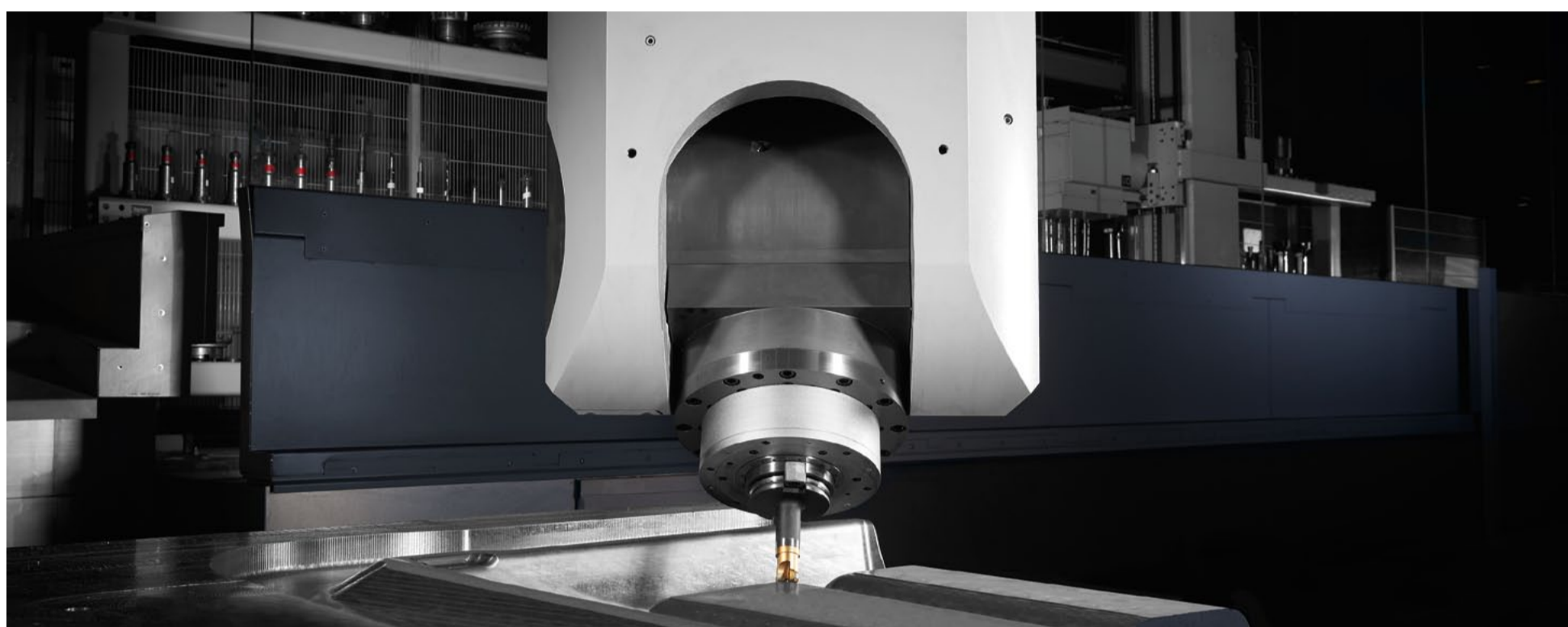


ProfiMill: Continuous C-axis for 5-axis machining



New C-axis for 5-axis machining for the ProfiMill series

Most manufacturers of portal milling machines have to admit defeat when it comes to 5-axis machining in high torque ranges. "Very few manufacturers are capable of providing this application at high torques. Yet, demanding machining tasks, such as free form surfaces, can only be solved this way," says Ralf Tschersche, Manager of Mechanical Engineering. This, however, is not the case at Waldrich-Siegen: "Last year, we have developed two portal mills which allow for 5-axis machining with a milling power of 80 kW at the Tool Center Point. Machines with a milling power of up to 120 kW are also available." The key: a continuously rotating C-axis.

Customized drive solution

The major innovative step was successfully realized in cooperation with the experienced manufacturer of special gearboxes RSGetriebe, also a Herkules-

Group company. The design and manufacturing departments cooperated closely to create a driving unit for the C-axis in the RAM that is specifically tailored to the requirements of the customer and the ProfiMill series. "The particular challenge in creating such a drive series, which has to be backlash-free and dynamic on the one hand and thermostable on the other, is the compact design. The drive must be integrated into the existing RAM geometry and allow for a torque of 7,500 Nm at the same time," Ralf Tschersche explains. Until now, a C-axis with Hirth serration was commonly used, which only covered the rotation degrees of a Hirth serration. In contrast, the continuous C-axis allows for rotation of $\pm 360^\circ$. The advantage: from now on, a milling head just requires a B-axis or A-axis to be capable of 5-axis milling.

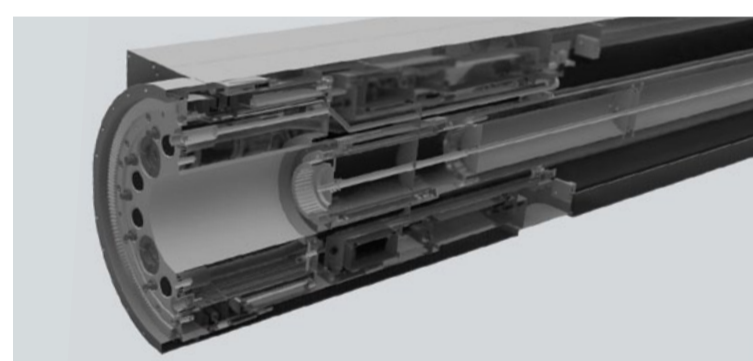
Modular sets for individual fields of application

Two portal milling machines of the ProfiMill series in gantry and table design have been developed and designed for 5-axis machining in high-performance ranges by WaldrichSiegen and RSGetriebe and have been in operation since 2015 with great success. The machines serve in the aviation parts supply industry. They have a main drive of 80 kW and a maximum torque of 7,000 Nm at the Tool Center Point, as well as a C-axis with 5,000 Nm. "To be able to instantly meet similar demands in the future as well, we have developed a modular set with the new drive technology," says President Marco Tannert. "The result: C-axis drives in different performance ranges, ideally tailored to the individual field of application."

In 2013, the ProfiMill series was expanded to include smaller construction sizes. With a width of 2 to 4 meters between the columns

and a milling force of 50 / 65 kW, they specialize in economic 5-side machining of medium-sized workpieces. 5-axis machin-

ing with up to 7,500 Nm taps into an additional, highly demanding field of application for this series.



Continuously rotating C-axis in the RAM

Performance range of the C-axis

	Level 1	Level 2	Level 3	Level 4
Torque [Nm]	1,750	3,000	5,000	7,500
Speed [min⁻¹]	50	50	10	10

Topics:

- Interview with President and COO Marco Tannert
- Machining generator and turbine rotors on one machine
- Two rolling mills, one roll grinder
- Five ProfiMills for market leader in shipbuilding
- Steel Authority of India counts on WaldrichSiegen technology

The moderate demand and order situation in recent years continues to have an effect on the entire heavy-duty machine tool manufacturing industry. We, too, struggle with unsatisfactory capacity utilization. Nevertheless, with a recent large-scale order comprising five portal mills in gantry design for China State Shipbuilding Corporation (CSSC), we are beginning to see a silver lining on the horizon.

We have put the past months to good use and intensively worked on the technological advancement of our products. We have made investments and fundamentally modernized our own production machinery. We are therefore ideally prepared for manufacturing cutting-edge, innovative machine tools.

We have created an additional option for 5-axis machining for our ProfiMill portal mills with a high-performance, continuous C-axis in the RAM – a joint development with our sister company RSGetriebe. An order for a rotor slotter for a leading manufacturer of turbine and generator rotors, a joint project with our sister company UnionChemnitz, gave us the chance to demonstrate the possibilities and advantages of the HerkulesGroup in the area of comprehensive solutions for the precise machining of large workpieces. The combination of the specific competences of both companies resulted in the development of a machine concept which is ideally tailored to the customer's requirements and is currently at construction stage.

In the course of the next weeks and months, we will continue to raise our profile, strengthen our core competences and optimize our processes and use of resources. Our aim is the continuous and sustained development of our machine tools and of the company WaldrichSiegen within a strong HerkulesGroup. As a result, our customers will benefit even more from customer-oriented, application-focused consulting and innovative solutions for all types of application in the future – with path-blazing technology and – as is expected from WaldrichSiegen – in the highest quality down to the last detail.

Marco Tannert
President

In October 2015, two leading positions in the company were re-staffed: Ralf Tschersche is the new Manager of Mechanical Engineering; Marco Tannert has been appointed new President and COO. Despite the challenging economic situation, Marco Tannert has ambitious plans – from product development to strengthening the presence in strategically important markets.

Mr. Tannert, how did your appointment as new President come about and what are your first impressions in your new role?

Marco Tannert: The shareholders have placed their trust in me. This fact and my own fascination with the large heavy-duty machine tools typical for WaldrichSiegen quickly convinced me to accept the challenge. I meet my new responsibilities with due respect – the first months were particularly exciting. I was already well familiar with some business areas, the company structure and important decision-makers, which made my first steps a lot easier. Nevertheless, leading a company of such rank is a great challenge, and I am proud to have been confided with such a task.

WaldrichSiegen celebrated its 175th company anniversary in 2015. Is such a long tradition more of an advantage or more of a disadvantage?

That depends. A long tradition is testimony to consistency and perseverance; in our business of high-quality investment goods, it shows that customers trust in the company and the brand WaldrichSiegen. The quality of the delivered machines fulfills their high demands. It provides for the prominence of the brand and for the relevant references. However, a long tradition also contains the danger of resting on one's laurels. A company culture that has grown over a long period of time can slow down or impede change and adaptation to the market and the market requirements which are changing ever

faster. In that case, tradition can become a risk. Despite, or possibly because of its long history of success, WaldrichSiegen is a dynamic company; in the area of product development, we often even anticipate future market requirements.

What requirements are those?

At the moment, major topics in heavy-duty machine tool manufacturing are automation, informatization and digitalization. The possibilities in that area are far from exhausted. In the near future, we will expand our value chain in both directions. In the area of forward integration, we will expand our influence and participation in our customers' product development, for example by simulating in detail the manufacturing process of our customers' products on their WaldrichSiegen machines. We will develop and provide the models for that. Backward integration will gain importance, too. After-sales service and ever-increasing machine availability are becoming more and more important for the customer. With regard to this, we will focus even more on sustainability, condition monitoring and preventive maintenance.

What exactly does the term sustainability mean in heavy-duty machine tool manufacturing?

WaldrichSiegen places a strong emphasis on the long service life of the machines, as well as energy efficiency and economic efficiency over the entire product life cycle. We are members of the "Blue Competence" initiative for sustainable technologies and solutions in machine manufacturing, led by the German Engineering Federation (VDMA). Energy efficiency of machines will gain even more importance in the future. On the one hand, energy prices are rising, especially in Europe. On the other, more and more of our customers turn their attention to their own ecological footprint. They plan sustainably and consider ecological risks and opportunities during



Marco Tannert, President of WaldrichSiegen since October 2015

their strategic investment decisions. At WaldrichSiegen, we work very hard on energy efficiency and sustainability. State-of-the art, energy-efficient components and units are used throughout our machines. Our hydrostatic guides with frequency-controlled pumps and optimized pocket geometries require less cooling power for the hydrostatic oil in total, and they belong to the most efficient ones in the market. In addition to the machines, we focus on the company itself – since 2010, our own extremely efficient cogeneration unit produces energy and heat for our own use.

A personal question – which values do you stand for as President?

Sincerity in the sense of personal and professional integrity, mutual trust and fairness in respectful interaction with each other and in the cooperation with business partners, and determination and

perseverance in the constant development of the company and our products.

What are you most looking forward to in your first year as President?

WaldrichSiegen will showcase its product range together with UnionChemnitz at the IMTS in Chicago this coming September. The economic forecasts for North America are positive. In addition, we have a distinct advantage there: KPM, our local production and service unit in Ford City, Pennsylvania. From there, besides services, we offer new machines that are designed and engineered in Germany and constructed in the USA according to German quality standards to our American customers. This is a highly promising market in which we will gather further momentum.

Thank you for the interview!

Marco Tannert: CV in milestones

- Degree in engineering with a focus on machine tools and production technology
- Research at the Fraunhofer Institute for Machine Tools and Forming Technology IWU in Chemnitz, Germany
- Research fellow, project leader and subsequently team leader

at the Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University
Area of expertise: metrological analysis and constructive design of machine tools

- 2012-2015: Manager of Mechanical Engineering at Herkules in Siegen and Meuselwitz

Five gantry ProfiMills for market leader in shipbuilding

WaldrichSiegen has received an order for five gantry portal milling machines from the Chinese market leader in shipbuilding. China State Shipbuilding Corporation (CSSC) is one of the biggest shipbuilders worldwide. The group of companies manufactures large and very large two-stroke diesel engines for container ships, among other products. Three milling machines, a ProfiMill 6000 and two ProfiMills 7000, are being built for Hudong Heavy Machinery Co., Ltd. Two more ProfiMills were ordered by another member of the Chinese group, CSSC-MES Diesel Co., Ltd. Delivery of the first machine to Shanghai will take place in mid-2017.

The ProfiMills 7000 for Hudong Heavy Machinery have a width of 7 m between the columns; the ProfiMill 6000 one of 6 m. Due to the gantry design with a traversing portal, the machines are very compact despite the large machining surfaces. In the future, they will be processing major components of large Diesel engines, base plates and A-frames, in the customers' newly-built

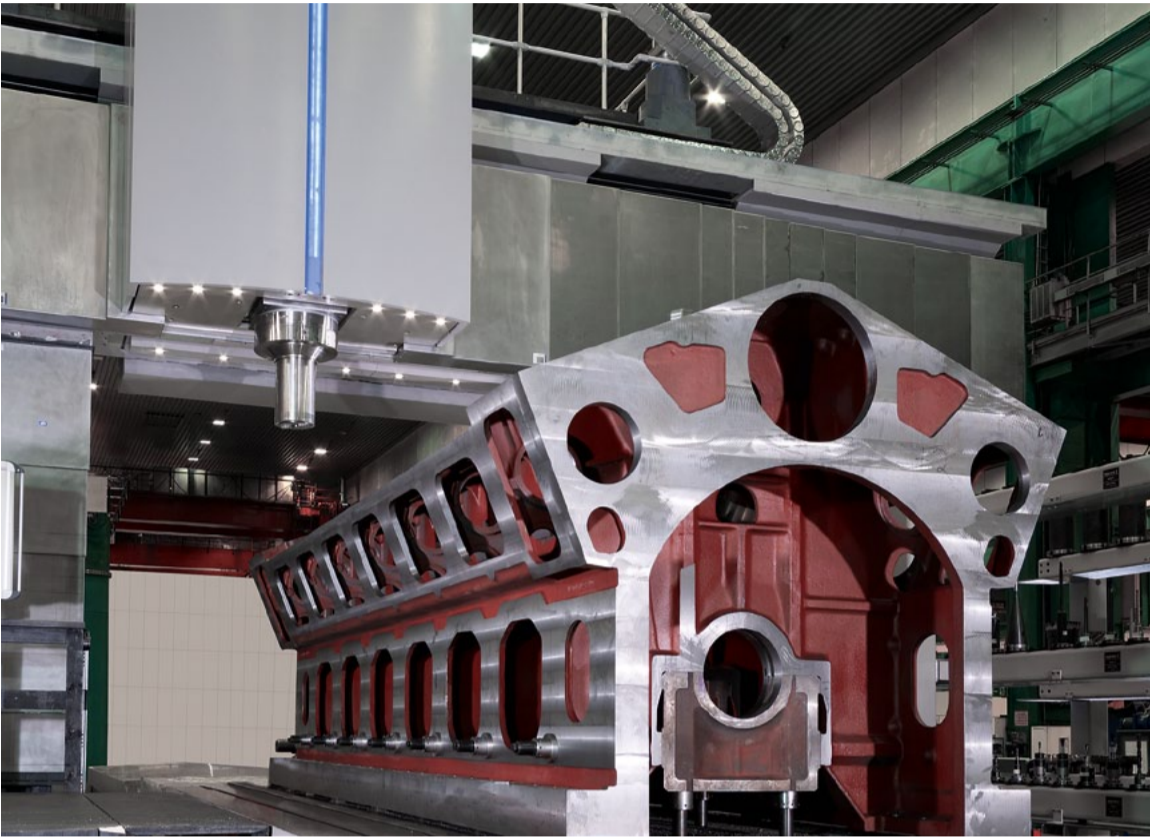
production sites. The table lengths of the portal mills are between 14 m and 24 m. Highly precise processing of components of such a large size is always a complex challenge. The required tolerances are in the area of less than 0,02 mm. A major difficulty is the processing of bearing shells, up to 13 depending on the number of cylinders, which must be perfectly aligned in order for the crankshaft to work flawlessly. Another challenge is the processing of crosshead guides. The milling machines are up to these challenges: the components are completely machined in a precise and efficient way. The portal mills are equipped with numerous milling units that are specifically tailored to the machining of different types of motors.

Since as far back as 1985, a good business relationship has been maintained between WaldrichSiegen and Hudong Heavy Machinery. A portal milling machine was delivered to its predecessor Shanghai Shipyard in that year. In 2013, the machine was modernized by WaldrichSiegen;

it still works to the customer's full satisfaction. A crankshaft lathe was built for Wuhan Heavy Machinery, another member of the CSSC group. WaldrichSiegen

surpassed international as well as German competitors in the current project. The compact build with a traversing portal and the flexibility of the machine due

to the large number of milling units were deciding factors for China State Shipbuilding Corporation.



ProfiMill: complete machining – precisely and efficiently

Machining of generator and turbine rotors with one single machine

Together with its sister company UnionChemnitz, WaldrichSiegen has raised the bar once again in the flexible machining of workpieces for the energy industry. In 2015, a contract covering the delivery of a rotor slotter with a floor plate was signed by a large American power plant manufacturer. The challenge: both generator rotors and turbine rotors have to be machined. Classic rotor slotters, however, are capable of machining generator rotors only.

It was clear from the earliest stages of the project that a new machine concept had to be developed to allow for both applications. Together, WaldrichSiegen and UnionChemnitz managed to meet this combination of technical and technological demands by combining a boring mill with special clamping devices. The machine adapts to the required technology with the help of special attachment units

for boring and milling. Thus, the rotor slotter is able to fulfill a diverse range of machining tasks.

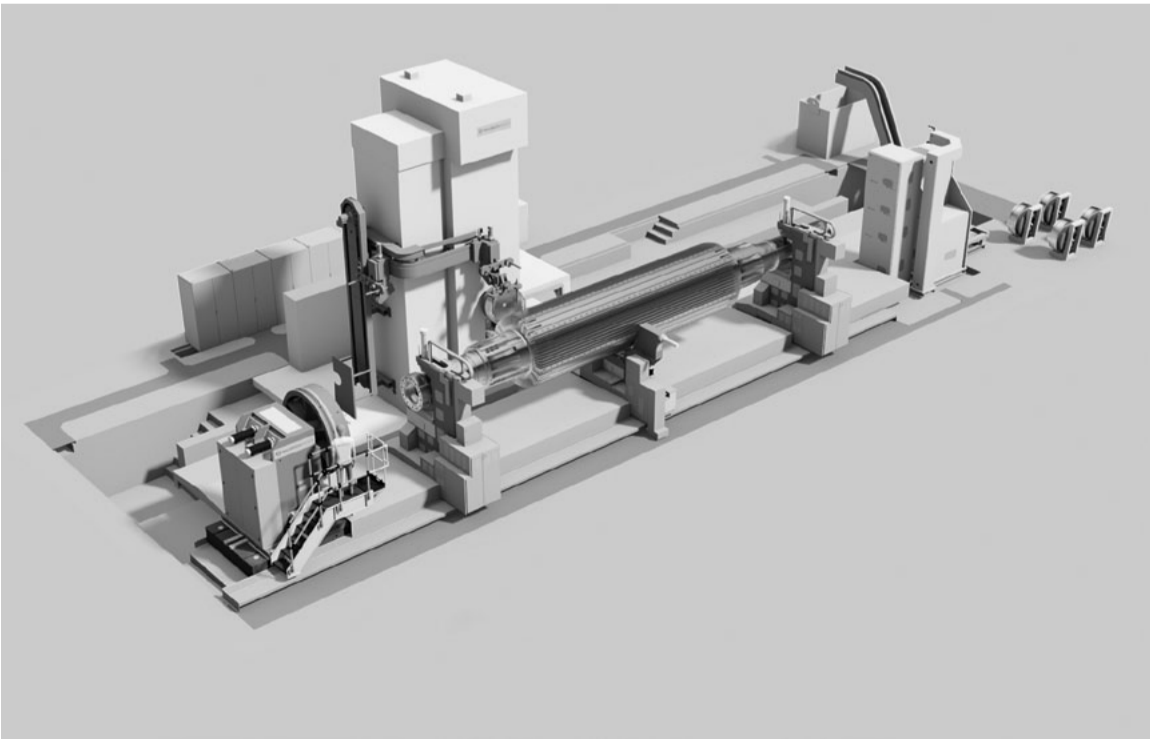
The PCR 260 is UnionChemnitz's most powerful horizontal boring and milling machine. It has sufficient performance, torque and speed to fulfill the tasks required by the customer. The cast iron bed is strongly ribbed and absorbs vibrations. Even when performing heavy-duty machining, a hydrostatic guidance system guarantees highest precision and protection from wear. The machine is equipped with an automatic tool changer for an efficient and time-saving machining process.

The workpieces to be machined are placed in a highly precise clamping device and can be adjusted with the help of numerically controlled steady rests. The rotor slotter machines workpieces with a length of up to 15,500 mm, a diameter of up to

2,400 mm and a maximum weight of 150 t reliably and accurately. The initial reactions on the

market have been positive and suggest that this product could be applied in many more inter-

esting projects.



The new machine concept of the rotor slotter allows adaptation to a diverse range of machining tasks

Expanding steel producer counts on WaldrichSiegen technology

The unique advantages of the ProfiGrind series have won over the investors of an ambitious expansion project of the Steel Authority of India Limited (SAIL) for its production site in Rourkela: a fully automated roll shop with two machines of the type ProfiGrind 5000 and ProfiGrind 2000 each were ordered by Primetals Technologies Japan (PTJ), the manufacturer of a new hot strip mill for SAIL Rourkela.

The new mill, which has an annual production capacity of three million tons, will produce hot strip for the automotive and white goods industry, which has to fulfill particularly high quality standards, among other products. WaldrichSiegen was therefore SAIL Rourkela's first choice when

selecting roll machining machine tools.

The universal roll grinders ProfiGrind 5000 and the ProfiGrind 2000 have unique advantages: hydrostatic guides ensure outstanding damping characteristics and dynamic stiffness. The hydrostatic bearing of the grinding spindle guarantees wear-free operation throughout the entire speed range, as well as extremely high machining accuracy. Thanks to the patented B-axis, a pivoting function which is integrated into a grinding wheel, the shape of the curve can be dynamically adjusted. The result: excellent surface qualities and shaping accuracy, short machining times and reduced wear of the grinding wheel as well as reduced stock removal.

One of the two universal grinding machines and both ProfiGrind 2000 are integrated into a fully automated roll shop in the hot strip mill. Its main components are delivered by WaldrichSiegen, as well. An automatic loader in semi-gantry design is in charge of fast and secure loading and unloading of the roll grinders. A Roll Shop Management System (RSMS) collects and analyzes the machining data, and controls and monitors the automatic roll transport. A roll cooling station and an automatic roll cleaning system complement the roll shop equipment.

Read the full article on waldrichsiegen.com/news



The ProfiGrind guarantees excellent surface qualities and shaping accuracy

Two rolling mills, one roll grinder

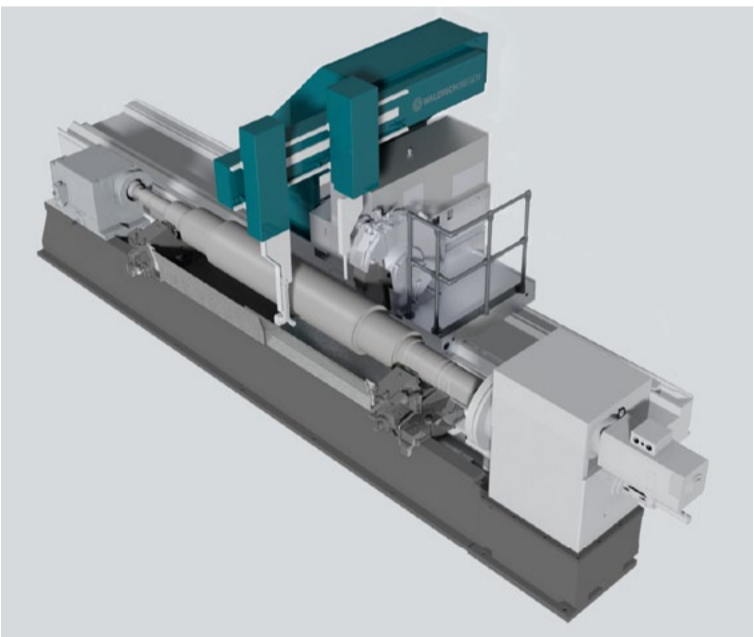
SMS Siemag AG has ordered a WaldrichSiegen roll grinder of the type ProfiGrind 4500. It is intended for a new reversing cold rolling mill for the Indonesian PT. Gunung Raja Paksi (GRP) that is currently being constructed by SMS Siemag. One of the major strengths of the machine concept is flexibility: the universal roll grinder is not only put to use in the machining of rolls in the new cold rolling mill, it will also be machining the rolls of a plate mill.

The ProfiGrind 4500 stands for precision and reliability. All main components are cast iron, machined within the company group. The robust design results

in high stiffness and excellent damping characteristics. Thanks to the hydrostatic guideways, the machine works wear-free and with extremely high positioning accuracy. The ProfiGrind 4500 therefore guarantees highly accurate machining results in Gunung Raja Paksi's cold rolling mill.

The universal roll grinder machines rolls with a maximum weight of 50 t, a length of 7,500 mm and a diameter of 1,550 mm. With these dimensions, it easily fulfills the customer's requirements in the plate mill, too. On top of that, it is equipped with a turning device for heavy-duty machining.

In this project, WaldrichSiegen again cooperates with SMS Siemag, a leading manufacturer of rolling mills and member of the SMS group. The end customer PT. Gunung Raja Paksi is a leading steel producer in the promising South-East Asian market and already has a WaldrichSiegen roll grinder in its machine inventory. As Gunung Raja Paksi wished to purchase a machine at "made in Germany" quality level, its choice fell on the renowned technology leader WaldrichSiegen.



Flexible machine concept: ProfiGrind 4500

Special performance for apprentices in the Apollo theatre

In Siegen's fully occupied theatre, the WaldrichSiegen apprentices, accompanied by CEO Christoph Thoma and his wife, were visibly – and audibly – delighted at the in-house production "The Intouchables" ("Ziemlich beste Freunde") on January 9. The performance was funded by the Apollo Education Fund ("Apollo Bildungsfonds"). One of the sponsors: WaldrichSiegen. On the occasion of the 175th company anniversary celebrated last year, the management asked for donations for the performance instead of flowers and presents. It was worth it: the show was a complete success.

WaldrichSiegen awarded World Market Leader Certificate

The Chamber of Industry and Commerce's (IHK) register of world market leaders in the region of southern Westphalia has gained a new entry. Klaus Gräbener, General Manager of IHK Siegen, ceremonially handed over the certificate to President Marco Tannert. The certificate underlines WaldrichSiegen's strong position as a leading brand in the market worldwide. Klaus Gräbener: „There are many companies with a history as long as that of WaldrichSiegen, but few companies stand for a whole region and are seen as a symbol of its economy. WaldrichSiegen is such a company."

Jubilarians 2016

Spending one's entire occupational life at WaldrichSiegen is not a rarity among employees. Yet, there is sometimes reason to honor particularly impressive performances: Karl-Heinz Adamek, Lothar Kuhr, Volker Schiffmann and Volker Schönau have now been with the company for 40 years.

The management would also like to express its gratitude and respect to Jens Bauer, Michael Klemm, Andree Kölsch, Mike Nitschke and Henning Röcher, who celebrate their 25th anniversary this year.

Trade Fairs

Visit us at the largest manufacturing technology show in North America – the IMTS in Chicago/USA. From September 12-17, WaldrichSiegen will present the latest developments in heavy-duty machine tool manufacturing together with its sister company UnionChemnitz. WaldrichSiegen will also exhibit at the AMB in Stuttgart/Germany, one of the leading trade fairs in the area of machining technology worldwide, from September 13-17. MACH-TOOL, the international trade fair for machine tools, will take place from June 7-10 in Poznań/Poland. WaldrichSiegen will present its strong technology portfolio here.

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