

CBN Technology Academy at Herkules

A giant leap for roll grinding technology

Economical, reproducible finish grinding with CBN wheels – Herkules and the Austrian grinding wheel manufacturer MACH ROTEC achieved this milestone in grinding technology with a unique technology package. Whereas till recently one could use CBN grinding only for rough grinding, and at very high costs, the innovative MACH ROTEC Herkules-Group grinding technology package now allows, for the first time ever, finish grinds of any type and with economical use of CBN coatings. The recipe for success: vibration damping grinding wheels and vibration damping machine technology with ultrafast control and measuring technology.

With this technology, Herkules and MACH ROTEC are the first on the market to fulfil the current demands of the industry. The industry faces the

possess any damping properties and are therefore not suited for finish grinding of the very hard HSS rolls. In contrast, MACH ROTEC's patented CFRP (carbon fiber reinforced polymer) wheel bodies offer stability and excellent damping characteristics directly at the contact point of wheel and roll.

The CBN wheels, due to their extreme hardness, forgive no mistakes. They always grind exactly what the control dictates. Only through the perfect infeed and damping of the Herkules machines – coupled with the simultaneous measuring and interpretation of events by the HCC/KPM controls and measuring devices – can one avoid geometric errors during CBN grinding.

The very light MACH ROTEC grinding wheel bodies allow cutting speeds of more than 80 m/s. This

Topics:

Machining in the roll shop

Homogeneous surfaces without defects

Herkules machine concept

The highest damping and ultrafast controls

MACH ROTEC wheel bodies

Maximum damping at maximum speed

Åkers rolls

Forged HSS rolls for cold rolling mills



Reproducible results in finish grinding with CBN coating – the innovative technology package by Herkules and MACH ROTEC

problem that the EU will ban chrome plating as of spring 2017. Furthermore, rolling mills demand ever better roll surfaces, longer rolling campaigns, better homogeneity and cleaner sheets. Cast and forged HSS rolls fulfil these requirements but could not be finished conventionally to the required quality. One reason for this is that conventional wheel bodies, made out of aluminium, steel or plastics, do not

minimize wear of the CBN coating and makes their use cost effective.

Despite the high cutting speed, the combination of reduced wheel pressure, short cutting duration and targeted coolant supply assure that the CBN grinding process actually transfers far less heat into the roll surface. This greatly reduces the risk of burn marks. The result of the grinding process

with MACH ROTEC HerkulesGroup technology is a homogeneous surface over the whole roll without any patterns, shadings or grit marks. The homogeneous surface structures reduce the outbreak of carbides during rolling and thus provide a cleaner sheet. Moreover, CBN grinding with the technology package has yet another advantage: Energy savings of ca. 25,000 Euro per machine and year (based on energy costs in Germany).

During the last two years, the technology package was successfully tested in 15 roll shops of customers from every industry. Interested customers can engage Herkules to grind their rolls so that they can then assess the performance of the new technology in their own mill stands.

Herkules presented the new technology package during a Technology Academy hosted together with MACH ROTEC and Åkers in April 2013.

110 participants from all over Europe attended the event in Siegen.

With the development of the new technology Herkules shows once again that they do not just sell machines, but that they develop the perfect solution for every application.



Protective hood for CBN grinding

Advantages of CBN grinding at a glance:

- Higher stock removal rates -> 30 - 50 % shorter grinding time
- Lower grinding pressure: high energy efficiency (e.g. 30 A instead 70 A load for roughing)
- Ideal for grinding unstable, slender rolls due to the low grinding pressure
- Homogeneous roll barrel surface for a clean rolled sheet
- Homogeneous surface roughness of 0,02 - 3 µm Ra, independent of barrel profile
- Surfaces without patterns, shadings or grit marks
- Surfaces without feed marks, even when grinding CVC+
- Optimal processes: stable and reproducible results
- Increased production capacity in the mill
- Minimal stock removal, fewer rolls required

CBN GRINDING

Machining in the roll shop: Homogeneous surfaces without defects

After Herkules and MACH ROTEC presented the theory of their technology package at the Technology Academy in Siegen, the participants were able to see the advantages of CBN grinding in action in the Herkules roll shop. The following rolls were ground:

Work roll – forged steel: Ø 150 x 660 mm

94 Shore C, crown: 0.02 mm

Roughness: Ra 0.041 - 0.042 µm

Stock removal: 0.04 mm

Grinding time: 40 min (conventional grinding ca. 70 min)

Work roll – cold rolling – Semi-HSS:

Ø 585 x 1380 mm

95 Shore C, crown: 0.05 mm

Roughness: Ra 0.41 - 0.43 µm

Stock removal: 0.1 mm

Grinding time: 31 min (conv. ca 45 min)

Work roll – cold rolling – HSS-INVICTA:

Ø 550 x 1415 mm

102 Shore C, crown: 0.05 mm

Roughness: 0.2 - 0.25 µm

Stock removal: 0.1 mm

Grinding time: 20 min (conventional grinding cannot yield acceptable surface qualities)

Work roll – hot rolling mill – forged steel:

Ø 800 x 2.565 mm

102 Shore C

Regrinding: 0.3 mm convex crown to 0.3 mm concave

Roughness: Ra 1.0 - 1.2 µm

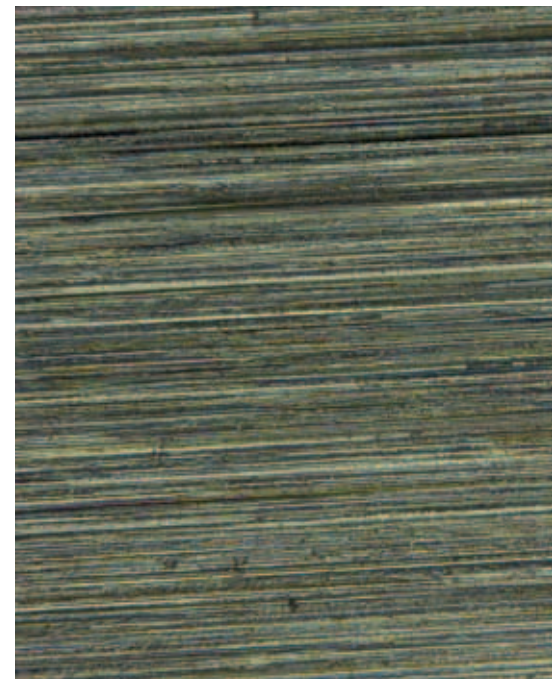
Stock removal mid barrel: 0.7 mm

Grinding pressure: ca. 40 % (conv. 80 - 90%)

Grinding time: 44 min (conv. ca 75 min)

All the grinding examples demonstrated outstanding performance:

- shape deviations between 1 and 2 µm
- homogeneous surfaces without any patterns
- run-out between 1 and 2 µm
- and homogeneous roughness over the entire barrel, irrespective of profile



Under the microscope: Homogeneous structure and roughness

Machine concept: maximum damping and ultrafast controls

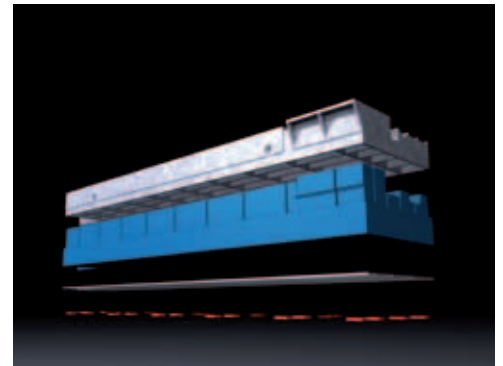
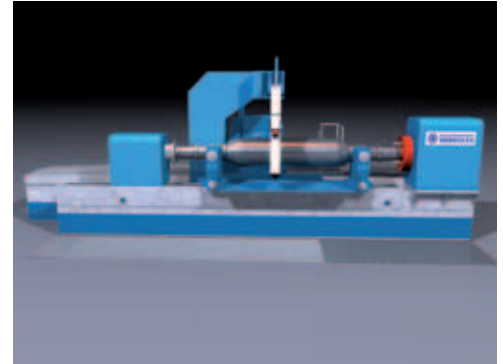
Herkules roll grinders offer all components needed for machining HSS rolls, which up to now could barely be ground or only with great difficulty, and for machining rolls with special surface requirements:

The inherently rigid, thermostable and foundation-free Monolith™ design does not only dampen vibrations brought on from the outside, but also the vibrations which inevitably occur inside the machine during the grinding process. Hydrodynamic slideways guarantee high rigidity and excellent damping qualities in the X and Z axes. At the same time, the hydrodynamic spindle bearing prevents any unwanted movement of the spindle and the grinding wheel, especially at high speeds. Here, Herkules uses the principle of Morgoil bearings well known in mills.

The HCC/KPM measuring and control system – developed especially for Herkules roll grinders – guarantees utmost accuracies when grinding with CBN wheels. By means of “correction grinding on the fly” it grinds the roll promptly with high accuracy. Two sensors in the C-frame, which measure during the grinding process, are the basis for that. The very fast control interprets the measurements immediately and thus avoids geometrical errors.

In addition to the high speed, the transmission of the data simultaneous with the event is essential for high-precision CBN grinding. The HCC/KPM 10 control is the only control worldwide to acquire measuring data, axis positions and infeeds in hard real-time and to act on them instantaneously. Thus, it guarantees perfect correction grinding. Thanks to the software PLC/NC and a high-performance IPC it is possible to directly process all the data.

Herkules offers machines specifically equipped for CBN grinding. First, the high grinding speed of more than 80 m/s requires adjustment of the grinding spindle bearing, oil supply, spindle cooling and safety measures like a special protective hood, safety circuits and interlocks (different speed limits for conventional and CBN grinding wheels). Furthermore, the machines need a grinding coolant supply with up to 10 bar pressure and a special nozzle. Also integrated are water splash guards, with a mist exhauster where necessary, a high-pressure water system for cleaning the wheel and a CBN dresser with high frequency dressing spindle.



With the foundation-free sandwich design the Monolith™ bed of the Herkules roll grinders absorbs all occurring vibrations.



The HCC/KPM system and its two measuring sensors allow simultaneous measuring and processing of events during grinding.



A protective hood covers the grinding wheel

Damping at maximum speed

MACH ROTEC GmbH, located in Salzburg/Austria, develops and produces future-oriented grinding wheels and grinding processes. The grinding wheels made of composite materials stand for maximum damping, low weight and maximal grinding speed. The grinding wheels are up to 90 percent lighter than steel wheels, have 20 times better damping characteristics and allow grinding speeds of 20 - 120 m/s. More than 3000 rolls have been ground with MACH ROTEC wheels without complaint and to the highest quality.

„We have absolute confidence in the joint technology package“, announced Christoph Thoma, chairman and CEO of the HerkulesGroup, during the Technology Academy, „and from now on the companies in the HerkulesGroup will have an influential role in the company MACH ROTEC“.

INVICTA: HSS rolls for cold rolling

The deployment of INVICTA HSS rolls from Åkers brings the customer important advantages over conventional rolls. First of all, INVICTA rolls offer greater safety since they are less likely to explode in the mill. Chrome plating, which will be prohibited in Europe as of 2017, is no longer necessary. In the mill, INVICTA rolls extend rolling campaigns up to five times, while the roll surface, due to its high hardness level, suffers no scratches or other defects. Thus, outstanding sheet qualities are achieved. Excellent roughness and texture retention, no chrome plating – all in all customers can reduce the costs for rolls and roll machining by 80 percent.



Imprint

HerkulesNews

Publisher: Maschinenfabrik Herkules Hans Thoma GmbH · Eisenhüttenstraße 21 · 57074 Siegen/Germany

Telephone +49 (0) 271 69 06 - 0 · Fax +49 (0) 271 69 06 - 222

Responsible: HerkulesGroup Corporate Communications

Maschinenfabrik Herkules Hans Thoma GmbH

Eisenhüttenstraße 21
57074 Siegen

Phone: +49 271 6906 - 0

Telefax: +49 271 6906 - 222

E-mail: info@herkules-group.com

Maschinenfabrik Herkules Meuselwitz GmbH

Industriepark Nord
04610 Meuselwitz

E-mail: mhm@herkules-group.com

Herkules USA Corp.

101 River Street

Ford City, Pennsylvania 16226 / USA

E-mail: husa@herkules-group.com

Herkules USA Corp. KPM

101 River Street

Ford City, Pennsylvania 16226 / USA

E-mail: kpm@herkules-group.com

HCC/KPM LLC.

101 River Street

Ford City, Pennsylvania 16226 / USA

E-mail: hcckpm@herkules-group.com

Deutsche Maschinen India Pvt. Ltd.

Palan Industrial Estate, Maheshtala

24 Parganas (South) - 700 141, West Bengal / Indien

E-mail: dmi@herkules-group.com

German Machine International Trading Co. Ltd.

No.108 Furun Nan Road

Jiaxing City, Zhejiang Province - 314000 / China

E-mail: gmt@herkules-group.com

Jiaxing GMT German Machine Tools Co. Ltd.

No.108 Furun Nan Road

Jiaxing City, Zhejiang Province - 314000 / China

E-mail: gmm@gmt-machines.com

Representative Offices:

Maschinenfabrik Herkules Latin America

E-mail: hla@herkules-group.com

Herkules North America Corp.

E-mail: hna@herkules-group.com

Maschinenfabrik Herkules Asia Pacific Rep. Office

E-mail: hap@herkules-group.com

Maschinenfabrik Herkules Shanghai Rep. Office

E-mail: hrc@herkules-group.com

Maschinenfabrik Herkules East Rep. Office

E-mail: hme@herkules-group.com

Maschinenfabrik Herkules India Rep. Office

E-mail: hri@herkules-group.com

Maschinenfabrik Herkules Gulf Region

E-mail: hgr@herkules-group.com