

High Pressure Grinding Rolls HRC™



The evolution of HPGR technology





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HRC™ HPGR

High pressure grinding rolls are preferred for their energy efficiency and flexibility in ore processing. Metso's unique take on this technology, the HRC™ HPGR, delivers even bigger – as the most advanced high pressure grinding roll on the market.

The technology

HPGRs utilize two counter-rotating tires – one fixed and one floating – in order to effectively crush ore. Hydraulic cylinders apply very high pressure to the system, causing inter-particle comminution as the feed travels between the two tires.

A focus on energy efficiency

The basic operating principle behind HPGRs makes them very energy efficient: The feed is introduced to the crushing zone, where high pressure is applied to the bed of material in a highly controlled manner. This

consistent high pressure sets the stage for more efficient size reduction downstream, by creating microcracks in the ore. Tiny microcracks weaken the particles, so that – even if the ore is not shattered – subsequent fine grinding requires the use of less energy to achieve final product size.

Key Benefits of HPGRs

- Reduced operating costs
 - Energy-efficient operation
 - No grinding media required
- Microcracking
 - Reduced downstream energy requirements
 - Improved recovery

High pressure grinding rolls were initially applied in the cement industry and have been used successfully since the mid 1980s

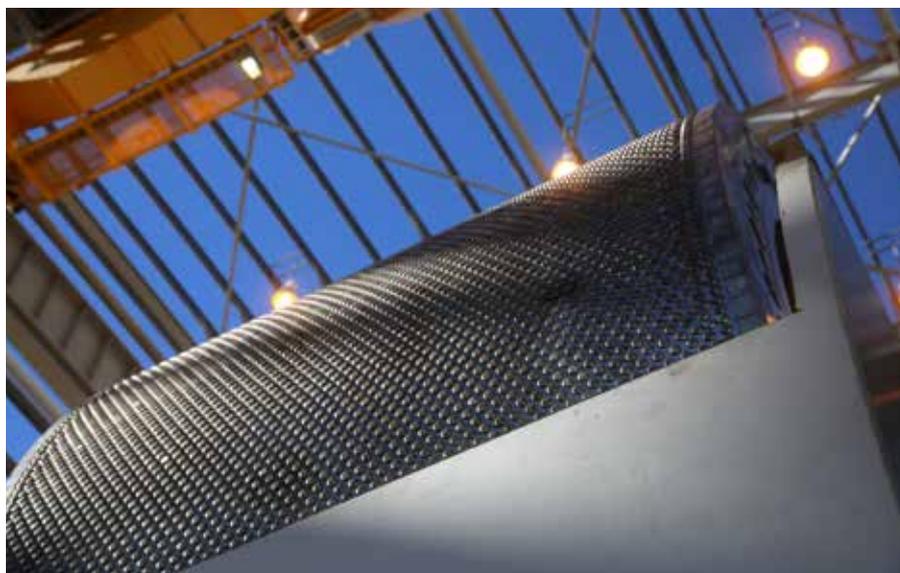
Over the past three decades, this technology has been applied to increasingly harder and more abrasive applications. And now, the HRC™ HPGR is taking this already-efficient comminution machinery to the next level.

Metso has made several key innovations to traditional HPGR technology in order to increase throughput and decrease total cost of operations.

Lars Gronvall

SVP Research and Technology Development





HRC™ HPGR Applications

Common circuits

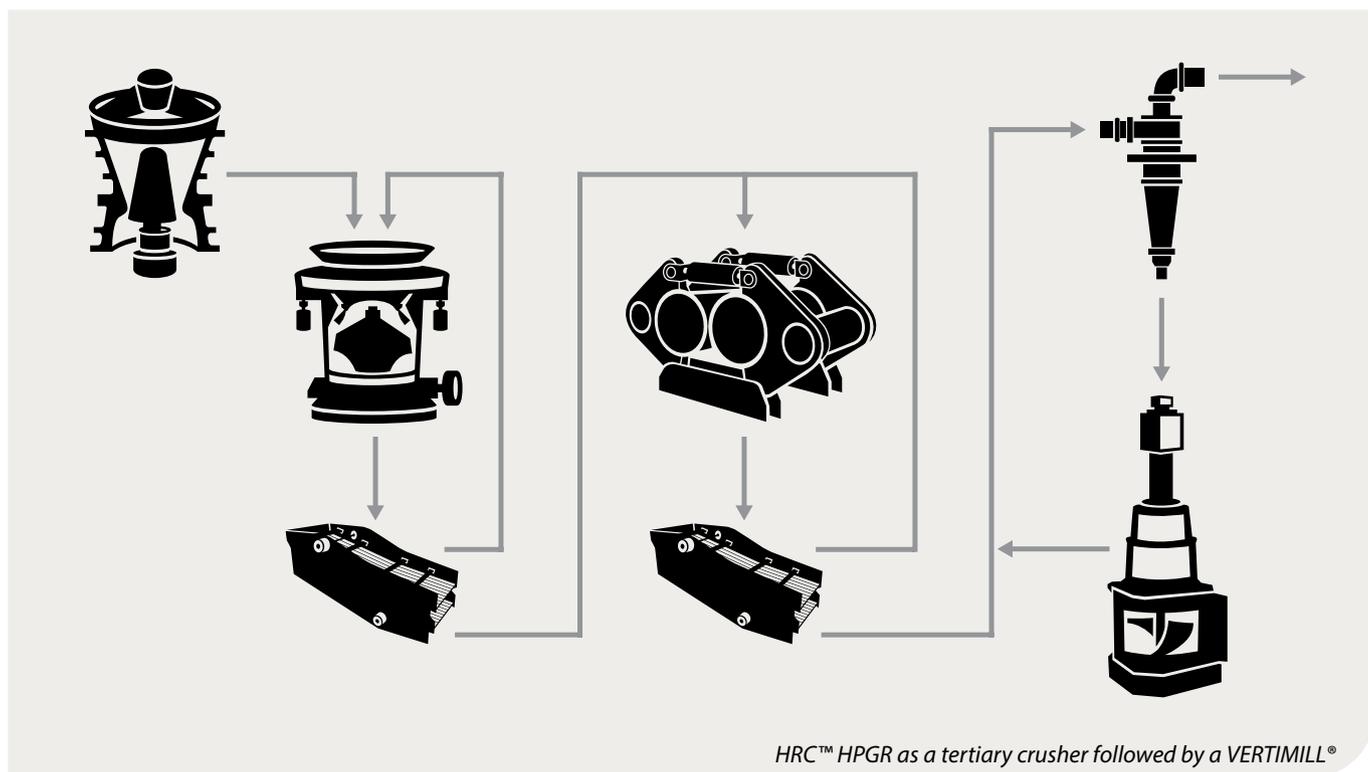
When selecting an HRC™ HPGR model, mining operators should consider ore top size, capacity and overall circuit design. The HRC™ HPGR is best suited for crushing in high-tonnage, hard rock applications. Common circuits utilize high pressure grinding rolls in a number of ways:

- Tertiary crusher, followed by a ball mill or VERTIMILL®
- Quaternary crusher, followed by a ball mill or VERTIMILL®
- In a pebble crushing circuit for a SAG/AG mill

Suitable ore types

The HRC™ HPGR is ideal for crushing hard

rock with relatively low moisture content and can provide superior results in the size reduction of a variety of minerals. Currently, HPGR technology is successfully operating in a number of applications, including diamonds, iron ore, copper, gold, platinum, molybdenum and industrial minerals.



HRC™ HPGR as a tertiary crusher followed by a VERTIMILL®



Upgrade your approach to hard rock crushing

When it comes to comminution technology, the demand for efficiency drives product development. Metso has committed its experts to engineering and manufacturing comminution equipment that is the most efficient on the market, and this was the goal in the creation of the HRC™ HPGR.

Model Name	Roll Dimensions Diameter x Width (mm)	Maximum Installed Power (kW)	Maximum Installed Power (HP)
HRC™ HPGR 800	730 x 400	2 x 110 kW	2 x 148 HP
HRC™ HPGR 1000	1000 x 625	2 x 260 kW	2 x 349 HP
HRC™ HPGR 1450	1450 x 900	2 x 650 kW	2 x 872 HP
HRC™ HPGR 1700	1700 x 1000	2 x 900 kW	2 x 1207 HP
HRC™ HPGR 2000	2000 x 1650	2 x 2100 kW	2 x 2816 HP
HRC™ HPGR 2400	2400 x 1650	2 x 3000 kW	2 x 4023 HP
HRC™ HPGR 2600	2600 x 1750	2 x 3700 kW	2 x 4962 HP
HRC™ HPGR 3000	3000 x 2000	2 x 5700 kW	2 x 7644 HP



Energy efficiency has been attracting customers to HPGR technology for years. Our new features, the anti-skewing Arch-frame – and the flanges in particular – are increasing machine capacity and further building on the efficiency of the process. That's what is driving customers to choose the HRC™ HPGR.

Victoria Herman
Product Manager, HRC™ HPGR

Innovative design:

Unique strengths

The unique, conceptual design of the HRC™ HPGR enhances this technology to the fullest extent, optimizing the reliability, capacity and energy efficiency of the machine. The bottom line: Our design – supported by Metso's service and expertise – works harder for you and your budget.

Increased availability

The patented Arch-frame in the HRC™ HPGR provides an even gap setting across the width of the tires. This is created by a torsion tube that connects both bearings, enabling the frame to pivot in its base and absorb any unbalanced loads caused by a segregated feed. The result: skewing that causes unnecessary downtime is eliminated, and your operation benefits from increased availability.

Maximum crushing efficiency, increased circuit capacity

The anti-skewing frame also eliminates the need for spring-loaded cheek plates, which are replaced by flanges in the HRC™ HPGR. Better than a traditional HPGR – in which a portion of material bypasses the crushing zone because of the gap between the tire and cheek plates – the flanges keep the bed of material within the HRC™ HPGR's crushing zone. This maximizes the amount of ore that is crushed; the HRC™ HPGR product is finer and the circulating load within the circuit is lower.

Optimal crushing pressure

Metso's hydraulic system delivers consistent force to ensure the material is crushed at the optimal pressure. The system is able to react quickly to changing conditions during operation: It includes pumps that continuously supply oil to the main hydraulic cylinders, and a small accumulator on the cylinders absorbs normal variations in pressure. In the event of a pressure spike or a change in pressure setting, oil pressure automatically adjusts via a proportional valve.

Our unique placement of the hydraulic cylinders, above the crushing zone, allows for a lower applied force while still providing the same high crushing pressure. This arrangement provides better protection for the cylinders: The cylinder rod travels a greater distance during normal operation, which ensures the seals stay lubricated.



Safety and superior maintenance

HRC™ HPGR

Metso equipment is designed to help you protect your investment. From wear parts that are designed for longevity to our industry-leading safety features, the HRC™ HPGR ensures quick, simple maintenance and superior operational safety.

Increased component longevity and ease of maintenance

Anti-skewing Arch-frame: The anti-skewing frame extends the wear life of the roller bearings and tire surface. It prevents misalignment, which typically causes damage to these wear parts.

Studded Tire Surface

- Metso's studded tungsten carbide surface provides optimum wear resistance.
- Supporting hard rock applications, an autogenous layer of ore forms in between the studs.

Flanges have an improved wear life over stationary cheek plates.

- The flange rotates at same speed as the ore.
- The wear surface area on the flange is larger than that of the cheek plate.

Flanges are designed for a fast field change-out; they are segmented and can be bolted directly to the tire.

Flanges distribute pressure more evenly along the width of the tire surface.

- Eliminates the bathtub effect (when the center of the tire wears faster than the edges).
- Point loading on studs is reduced, decreasing the risk of stud breakage during operation.

Safety you can count on

Transporter: The transporter enables a safe and quick change-out of the tires.

Dust Enclosure: The enclosure provides a cleaner and safer working area for personnel.

- It provides added bearing protection (beyond the standard labyrinth seals and housing) by separating the shaft bearings from the crushing chamber.
- Various access points make maintenance simpler than ever.



The Metso difference

HRC™ HPGR

Metso's comprehensive service offering is an integral part of our mining customers' efficiency and profitability. Our global resources and industry-leading expertise are backed by service locations all over the world – so you can always count on a local partner to help overcome unexpected challenges or scheduled, regular maintenance.

Life Cycle Services

We implement industry-best practices at each step of your operation to achieve optimum performance and guaranteed results. Metso's life cycle services offering includes new installations, maintenance services, process improvements, as well as upgrades and rebuilds.

Spare and Wear Parts

Using Metso parts for preventive maintenance reduces operating costs, limiting downtime and the number of unexpected breakdowns. Our parts are manufactured according to OEM specifications using high-quality materials, tools and techniques.

Global Distribution and Logistics

Metso's global resources reach the dozens of worldwide locations, ensuring that the right part is in the right place at the right time.

Advanced Performance Materials

The Process Technology and Innovation (PTI) group is always working to develop spare and wear solutions that offer extended wear life and maximum performance – even in the most demanding applications. Our team

of engineers emphasizes the importance of understanding the problem first, and then developing solutions based on available field measurements, established processes and product knowledge. Our approach can save your operations time and money, providing solutions that offer improved throughput without the investment in new equipment.

Training

Expand the knowledge of your workforce: We offer a broad range of training courses that help our customers significantly improve their market position and return on investment.

Field Services

Metso provides emergency field plans and other customized services solutions based on your needs and priorities.

Preventive Maintenance Agreements

Metso's maintenance strategy ensures that plants are running at full capacity and accounts for maximum efficiency in the face of scheduled interlocks and shutdowns. Customers can rely on maintenance services for optimum life cycle performance and to minimize operations management workload.

Automation Solutions

Automation systems can help streamline mining operations, and Metso offers one for every level of plant complexity. Our custom approach ensures efficiency in terms of production, cost, equipment life and security.

Equipment Refurbishment

Industry-leading technical and manufacturing specialists keep equipment in optimum working order and partner with customers to identify and help execute any further enhancements or modifications that may increase productivity.

Plant Diagnostics and Upgrades

Our engineers analyze crushing and grinding circuits to help you make smarter upgrades. Diagnostic experts will pinpoint the most productive opportunities, and you'll benefit from substantially increased production and optimized equipment setup for your application.

Performance Contracts

We work under integrated contracts that guarantee production goals based on vital performance measurements, all of which are monitored and addressed through a well-planned management program.

The Metso Way – Making the big difference to our customers

Everything we do is based on deep industry knowledge and expertise that makes the big difference to our customers. Decades of close customer collaboration and adapting to our customers' ever changing needs have transformed us into a knowledge company.

