



Drive systems for high pressure grinding rolls

RollXtend™

Increased roller life and productivity

High pressure grinding rolls in mineral processing

Moving from cement to hard rock

High pressure grinding rolls (HPGRs), also known as roller presses, are rapidly gaining acceptance in hard-rock processing, primarily due to their energy efficiency when reducing mineral ore to fragments.

Application challenges

Today's highly competitive mining industry calls for continuously operating, high throughput equipment, such as the HPGR, to be designed for maximum availability and reliability. A HPGR's optimum point of operation is widely influenced by ore properties like feed size, hardness and feed rate.

Energy cost and water savings, smaller plant footprint and extended availability are some of the main reasons HPGRs are widely used in crushing and grinding circuits.

Optimizing HPGR to maximum capacity

To ensure maximum optimization of a HPGR, many critical factors must be considered when selecting the drive solution including:

- Maximum throughput
- Minimum roller wear
- Highest degree of operational flexibility
- Maintain high availability
- Ensure lowest operation and capital costs

ABB's smart solution for HPGRs delivers on all these key factors, making it the optimal system to enhance grinding productivity of the HPGR.

ABB Ability™ MineOptimize

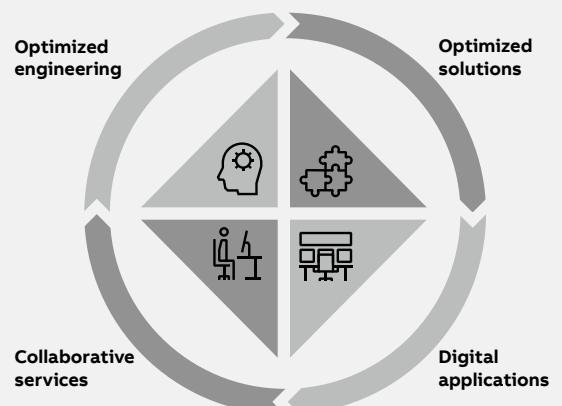
ABB Ability™ MineOptimize is a 4-pillar framework that takes a deep dive into all aspects of a mine to identify ways in which to fine-tune and optimize every process, every sensor and device, every application and every service. The four pillars include optimized solutions, optimized engineering, digital applications and collaborative services.

One of the four pillars focus on ways to optimize solutions like the high pressure grinding rolls (HPGR). Without the in-depth domain knowledge of ABB's engineers and their decades of simply knowing where to look, getting the absolute best return on investment may be missed.

ABB Ability MineOptimize gets the best from a HPGR, leading to increased availability and lower lifetime operating costs. It is a combination of

domain knowledge, leading edge technology and vast global and local engineering competence – all under one roof.

Before you select your next grinding solution, get the bigger picture courtesy of ABB Ability™ MineOptimize.



Variable speed drive system for HPGRs

Engineering expertise translates to optimal grinding results

ABB's state-of-the-art HPGR uses a variable speed drive system. Decades of engineering expertise translates into an optimized drive solution specially engineered to fit the specific site and HPGR requirements.

Standard system components

While the complete system is tailored, based on customer specifications, the following components are part of the standard package:

- Converter (voltage source inverter topology)
- Transformer
- Motor

When evaluating between a medium or low voltage system, ABB's engineering experts not only consider the HPGR motor power, but also how to optimize cost without compromising performance and reliability.

Power supply and control center options

ABB offers two options for power supply and control center design: integrate power, control and auxiliaries into the existing E-rooms, or choose a self-contained, pre-commissioned solution.

Optional system services

- Torsional analysis of total drive train to validate design.
- System commissioning by dedicated application experts to ensure flawless operation.

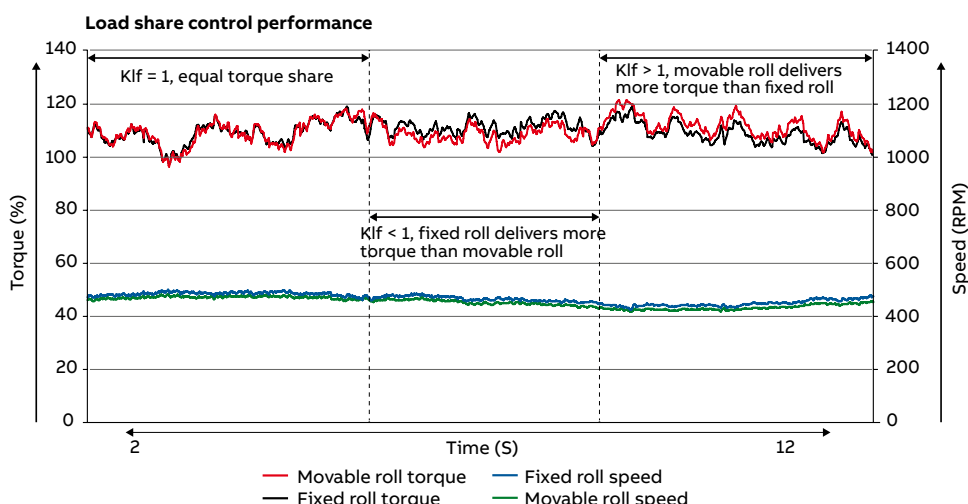
HPGR drive system with RollXtend™ technology

ABB's HPGR drive system with RollXtend technology provides dynamic load share control of torque and speed.

A HPGR with a brand new set of rollers, starts operation with identical torque and speed. Over time, and based on various operating factors (e.g. ore characteristics, operating pressure, feed etc.), the rollers experience different wear rates. With RollXtend's dynamic load sharing function the load provided by both rollers can be fine-tuned by the operator based on the wear rate measured.

The roller torques are managed by the load share factor (Klf). If $Klf = 1$, identical torque is delivered by both rollers. For values of $Klf < 1$ the fixed roller delivers more torque than the movable roller. For values of $Klf > 1$ the movable roller delivers more torque than the fixed roller. Klf can be varied in fine steps. Irrespective of the Klf value, the speeds of both rollers will be matched, keeping slip to a minimum.

As a consequence of suitably adjusting Klf, the HPGR rollers will wear equally, extending the overall life time of the roller pair.



Intelligent operation and protection features

Ensuring increased roller life and productivity

To benefit from using HPGRs in comminution, and reaching optimal productivity, a reliable and flexible drive system is essential. With its advanced smart operation and protection features, ABB's drive system ensures optimal productivity, operational efficiency and increased roller life for your grinding operations.

1. Dynamic load sharing

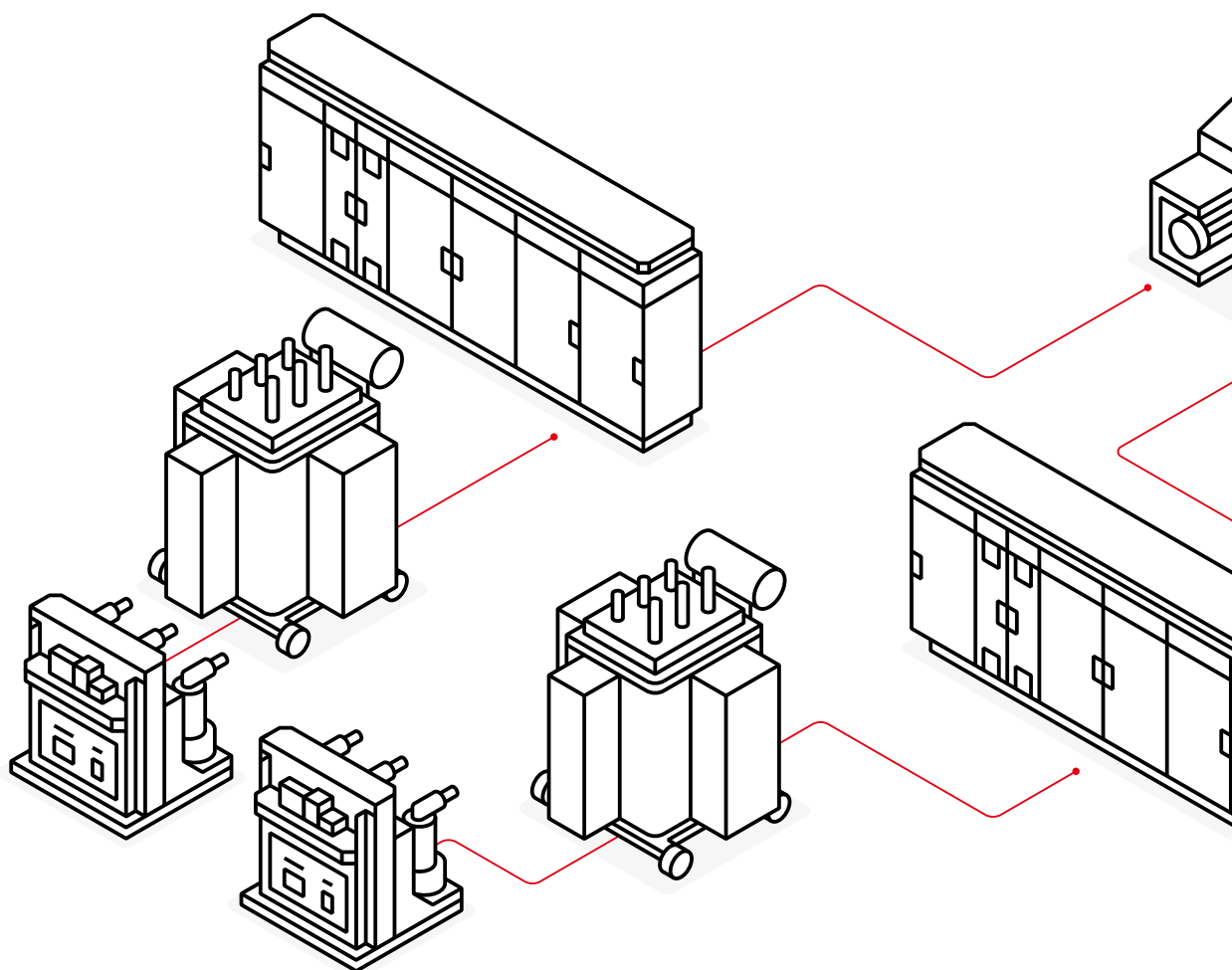
The RollXtend technology gives full flexibility to vary the torque delivered by each roller, while maintaining identical circumferential speed.

2. Maintenance mode

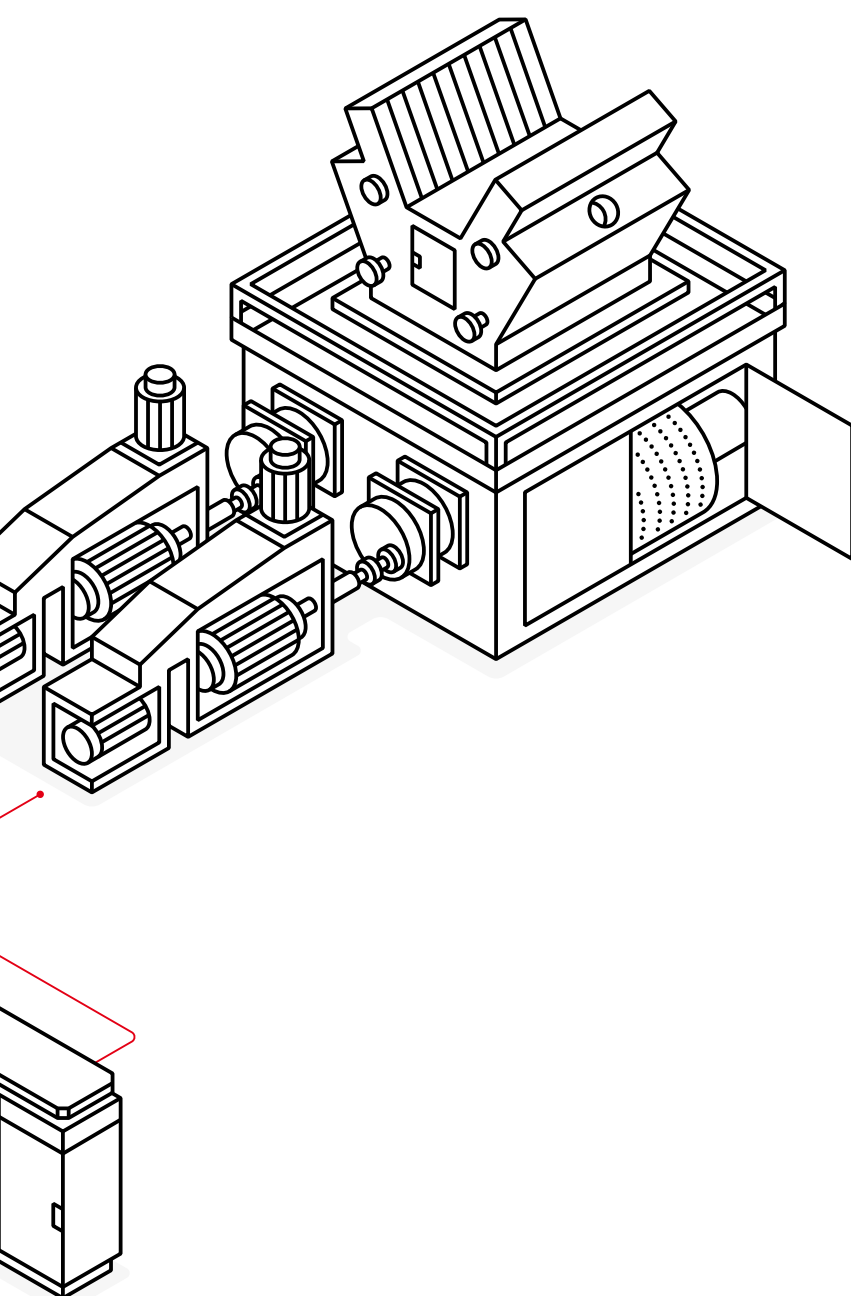
Roller creeping for inspection and maintenance activities is achieved with ABB's dedicated maintenance mode function combined with the easy-to-use drive system HMI. This eliminates the need for an auxiliary drive.

3. Upstream breaker management

The drive system controls the upstream medium voltage breaker, guaranteeing co-ordination with the total system operation, ensuring operator and equipment safety.



To further enhance HPGR productivity ABB offers optional drive system components and features such as specially engineered motors, vibration monitoring and a surge protection feature.

**Specially engineered motors**

To withstand axial and radial forces caused by the floating roller and transmitted to the motor shaft via the cardan shaft, ABB designs and delivers specially engineered motors that fit individual HPGR specifications.

Vibration monitoring

On request, the motors can be equipped with vibration sensors. The drive system can be set to raise alarms upon recording abnormal vibration levels in the motor, which may be caused by excessive forces being transferred from the HPGR due to process abnormalities (e.g. irregular or oversized feed).

Surge protection feature

With site-specific surge protection, equipment damage, resulting from long cables between breaker and transformers or other devices, can be prevented.

Operational advantages and benefits

Maximize availability and HPGR performance

Investing in grinding assets is a significant decision for any company and directly impacts production capacity and profitability of operations. ABB's intelligent HPGR solution provides operational advantages and benefits to support productivity targets.

Cost benefits

- Maximized total roller life due to equal roller wear with RollXtend technology.
- CAPEX and OPEX savings (time lost in engaging and dis-engaging auxiliary drive) as need for auxiliary drive is eliminated for maintenance operations.

Operator and equipment safety benefits

- Increased operator safety with maintenance mode. Inspection and maintenance activities can be performed without auxiliary drive.
- Converter control of upstream circuit breakers avoids equipment damage resulting from transformer in-rush currents.

• Coupling supervision

Monitors deviations in torque. In case of a coupling failure, the drive detects it and trips.

• Stand still detection (optional)

To protect mechanical and electrical drive system components, the motors should not restart if the rolls are still turning after a stop command. This function detects if the rolls are standing still and then releases the start command for the operator.

• Over-duty cycle mode (optional)

The over-duty cycle mode permits additional

torque for a certain amount of time to overcome overload situations (e.g. improper feed rates), allowing operators to implement corrections and avoid machine stoppage.

Electrical benefits

- Network friendly operation.
- Current and voltage harmonic within IEEE 519 limits eliminates need for additional filtering equipment.

Process and operational benefits

- Instant roller reaction to change in ore characteristics and hopper feed rate by setting of appropriate speed.
- Quick reaction to frequent load changes (e.g. irregular feed size) possible with direct torque control (DTC) used in converter.
- Lower pressure spikes and reduced stud breakage due to maintained small zero and operating gap.

Mechanical benefits

- Reduced mechanical stress on gearbox and reduced roller damage due to smooth starts at high torque.
- Fatigue failure protection of drive train and gearbox via torque limits in the drive.
- Prevention of high intensity vibration caused by variations in feed due to use of variable speed drive.



ABB Ability™ MineOptimize collaborative services

Enabling future mining



To take full advantage from the internet of things, it is necessary to have a system that supports a flexible, scalable and reliable cloud platform with a range of comprehensive service offerings.

Partnering with an experienced supplier who supports your needs and ever changing site requirements is ABB's answer to minimize risks and increase overall performance through digitalization. Through its global Collaborative Operations Centers, ABB's experts protect your plant throughout equipment lifetime regardless of the location of your mine.

With over 50 years of global experience in grinding solutions, our dedicated experts continuously develop and improve ABB's drive system for high pressure grinding rolls to match the latest challenges in grinding circuits. ABB's RollXtend solution is part of the ABB Ability™ platform with a customized range of services intended to maximize uptime and reduce operating costs.

The portfolio covers:

- Installation and commissioning
- Remote services, including SupportLine 24 hours x 365 days per year
- Periodic maintenance with scheduled asset audits
- Collaborative services like remote assistance, predictive maintenance and performance optimization through ABB Ability™ platform
- Preventive and corrective services
- Spare parts management
- Customer training based on ABB University approved methods

Portfolio	Service clusters	Services	
ABB lifecycle services portfolio	Extension upgrades and retrofits	Software upgrades	Hardware upgrades
	Spares & consumables	Spare parts lists and parts kits	On-demand spares
	Training	On-site	Classroom
	Technical support & repairs	Emergency on-site support (Technical support)	Start-up support
 Do more Monitor, control, secure, manage, apply	Remote assistance	24/7 SupportLine and troubleshooting	Remote support
	Asset health	Preventive maintenance services	
	Virtual training	Remote learning platform (RLP)	E-learning
	Inspection	Scheduled maintenance	On-demand service
	Lifecycle assessment	Plant lifecycle assessment	System enhancement studies
	Predictive maintenance	Online fault prediction and notification services	
	Cyber security	Periodic assessment & fingerprint services	
	Energy optimization	Energy optimization services	
	Performance optimization	Performance & quality optimization	
	 Do better Optimize, simulate, predict, automate		



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