



Ring-gear mill drives

RMD^{plus}

Variable-speed solution with advanced mill features

High performance and flexible grinding

Ring-geared mill drives in mineral processing

Grinding is a significant and critical part of the ore extraction process. On average, milling is the process that requires the most energy in the entire mining operation. To ensure profitable operations, an efficient grinding circuit is needed, especially now that global mineral resources are decreasing, and the exploitation of low-grade deposits are necessary. This trend led to the development of new technologies able to cope with larger equipment that can generate higher throughput.

While single pinion mills used to be enough to process all material, today dual pinion or gearless driven mills are necessary. Furthermore, the mill equipment needed to be adapted to exceed its technical and performance limits. Meanwhile, drive solutions are evolving opening up new grinding frontiers. Nowadays more and more mills are fed by frequency converter systems, allowing for higher performance and flexibility of operation.



ABB Ability™ MineOptimize

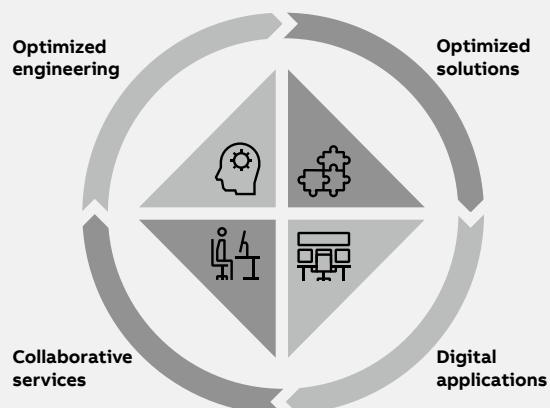
ABB Ability™ MineOptimize is a 4-pillar framework that takes a deep dive into all aspects of a mine to identify ways in which to fine-tune and optimize every process, every sensor and device, every application and every service. The four pillars include optimized solutions, optimized engineering, digital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

One of the four pillars focus on ways to optimize solutions like the ring-geared mill drives (RMD). 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 RMD, 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.



The RMD^{plus}

Excellence in engineering translates into optimal mill drive design to fit your needs

The RMD^{plus} solution offers all the advantages that come with a voltage source inverter technology combined with high flexibility and additional functionalities developed and customized for grinding applications.

Solutions to fit your needs

Whether a mill is single or dual pinion, high- or low-speed, ABB offers the right solution. Motors are fed by frequency converters that allow speed variation and soft control during starting and stopping of the mill. When a dual pinion configuration is applied, care must be taken to ensure the load is shared equally between both pinions. ABB's fast, direct torque control (DTC) and the overriding controller, deliver extremely accurate and coordinated load sharing.

Inherent advantages

- Smooth control protects mechanics
- Low starting current
- Power factor > 0.95, even leading as an option
- Low maintenance and high availability

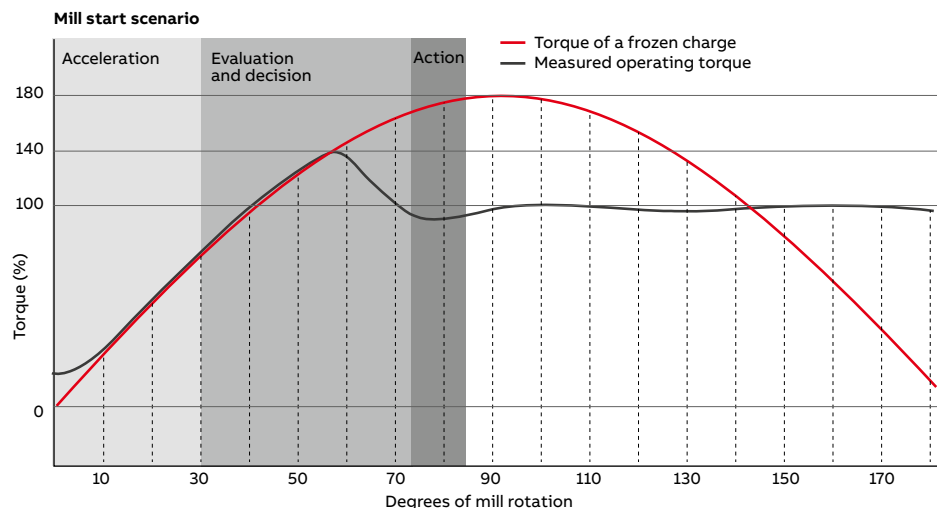
These inherent features protect the mechanics during normal operation and starting by limiting and controlling the torque accurately, thereby eliminating backlash on pinions and gearboxes and extending lifetime of your mill. In addition, the frozen charge detection and removal functions further ensure reliability and availability of the complete system.

Adding value to your assets – mill auxiliaries' controller

Combining both power and control of the mill and its auxiliaries brings out the best from the latest technologies. The mill auxiliaries controller, based on ABB Ability™ System 800xA, provides real-time information for better and faster access. It ensures data consistency and improves engineering performance. System 800xA engineering supports a consistent information flow from design, through installation and commissioning, to operation and maintenance.

A complex system made simple – E-House for RMD

By integrating power and control of the mill into a self-contained, pre-commissioned solution, the RMD^{plus} e-house has the complete electrification and automation of the mill in one location. This allows easier and faster installation and commissioning. During operation, simpler lock out procedures and fast trouble-shooting are possible because everything related to the mill is located in one place.



Mill protection and operation features

Ensuring smooth operation for ring-geared mills

State-of-the-art protection and operation functionalities are designed to keep production running smoothly and efficiently.

Frozen charge detection

The mill controller detects frozen charge by analyzing the mill's angle and dynamic torque during starting. A dedicated algorithm can even detect smooth cascading. The mill stops automatically – preventing frozen charge to drop or being accelerated to higher speed.

Frozen charge remover

ABB's patented method for detaching frozen charge from a tube mill applies superimposed torque steps on top of the actual motor torque to loosen the charge from the shell. Both torque and speed are always positive, therefore the contact between pinion and ring-gear is maintained, hence no backlash in the mechanics.

Controlled rollback

This function smoothly brings the mill to a standstill position where both speed and torque are zero. The load then being balanced at the bottom of the mill, prevents mill rocking and ensures a faster stop without backlash.

Stand-still detection

To protect mechanical and electrical components of the mill drive system, the motors should not restart if the mill is still rocking or moving after a stop command. This function detects when the mill is standing still and can be started safely.

Coupling supervision

Deviations in torque are monitored between the two pinions and respectively the torque behavior in the single pinion configuration. In case of a failure or a slippage of one or both couplings, the drive detects it and trips, thus preventing major damage.

Mill power ride-through

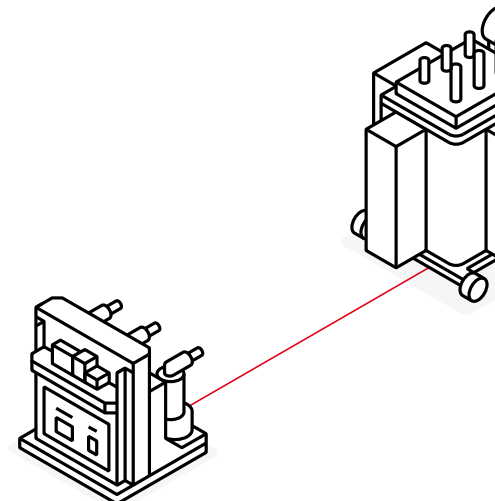
Network variations, frequently faced in remote mining areas, can be countered with the mill power ride-through. It ensures that the mill keeps running even if the voltage reduces. Additionally, the controller accelerates the mill smoothly back to operational speed when the voltage is recovered.

Over-duty cycle mode

In case of mill overloading, the over-duty cycle permits operators to correct the feed rate while keeping the mill running. The drive system generates additional torque for a certain amount of time to overcome the overload.

Oscillation damping

Depending on the mechanical set-up of the mill, certain natural frequencies (when the system tends to oscillate in absence of any driving force) can appear, resulting in additional fatigue of the mill components. ABB's patented method actively calculates these frequencies and consistently damps them.



Mill maintenance features

Creeping mode and automatic positioning for easy maintenance

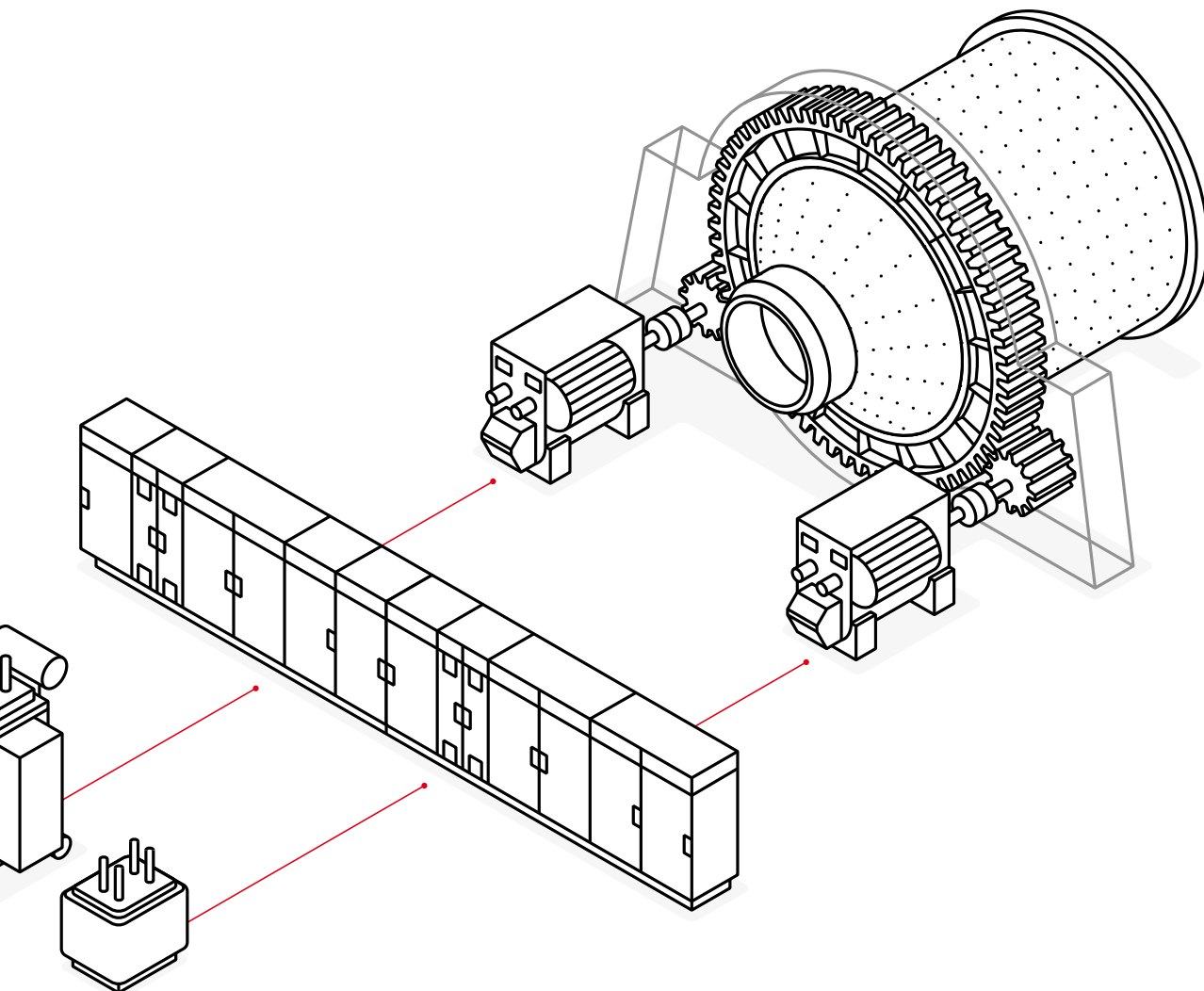
The RMD^{plus} solution features easy service and maintenance. The main drive can be used for creeping and automatic positioning without any additional hardware, such as an inching system.

Creeping mode

Adjustable low speed can be used to perform visual inspections. Fast stop ramp can be individually set to avoid overshoot which would occur if the mill is stopped too slowly. Upon request, the creeping mode can be dimensioned to go down to 1 percent of nominal speed when needed.

Automatic positioning

To perform liner changes, the drive automatically brings the mill to the operator-selected angle or liner reference. This function includes cascading compensation and fast stop ramp for accurate and rapid positioning, hence reducing downtime needed for liner changes.



Choosing the right solution for your grinding process

Advantages and benefits

Operational advantages

- Operator can rapidly react to changes in ore characteristics or quantity by varying the speed.
- Process optimization leads to a more efficient use of grinding power, resulting in significant energy savings.
- Fine-tuning of the speed in mills increases metals recovery.
- ABB's dedicated mill controller performs critical monitoring, protecting the mill.
- Frozen charge protection for safe operation.

Mechanical benefits

- High starting torque availability – start the machine coupled directly to the mill.
- Reduced mechanical stress on the ring gear, gearboxes and pinions.
- Smooth starting and precise torque control due to DTC technology even at low speed.
- Load sharing between the two pinions is controlled actively and accurately.

Electrical benefits

- Suitable for weak networks, the system has low starting current seen by the network and power factor to the network higher than 0.95 lagging under all conditions.
- Resilient to voltage dips very common in remote mines. The system provides fewer restarts thus giving more grinding time.

Maintenance benefits

- The ABB mill local control panel (MLCP) makes maintenance easier and enables direct communication with the drive.
- Creeping and automatic positioning modes eliminate the need for an auxiliary motor and reduce maintenance time.
- Frozen charge remover – for a faster return to operation.
- Remote supervision and diagnostic options enable fast and easy support.



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, ABB's dedicated experts continuously develop and improve its drive system for ring-gearred mills to match the latest challenges. ABB's RMD^{plus} is part of the ABB Ability™ platform with a customized range of services intended to maximize uptime and reduce operating costs.

Service solutions for your grinding mills

For continuous and cost-efficient operations, ABB offers a range of services, regardless of where production site is located. These services range from phone support to complete long-term service agreements:

- 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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