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## Grinding transformation

Gearless mill drives, digitalization, AI and analytics are transforming grinding operations at mines worldwide

# Mining: optimized

**Grinding operations at mines around the world are undergoing a transformation.** Multiple marketplace pressures are driving mining owners to deploy technology solutions that minimize energy use and maximize productivity while achieving sustainability objectives.

Here are the top four drivers of digital transformation in grinding operations.

## 1 Productivity

Mines are facing increased pressures to maximize returns on assets and reduce time to get first ore. Global disruptions in the supply chain caused by world events are also putting pressures on mines to get the most productivity possible out of existing assets.



## 2 Sustainability

Partly because of regulatory pressures, partly from customer demand, but mainly for business objectives, mines are increasingly adopting sustainable business practices. They are setting ambitious sustainability targets that help them reduce their energy consumption, lower their greenhouse emissions, and minimize their environmental, social, and economic impacts.

## 3 Demand

Growing pressure from the marketplace for minerals, particularly those used in the production of batteries for electric vehicles, are forcing mines to optimize equipment availability, gain real-time visibility into production issues, and increase asset utilization.

## 4 Grades

Low ore grades are a growing challenge for mines around the world. Mines are having to process more material to extract the same quantity of minerals, requiring larger mills and higher energy costs. Mines are seeking solutions that help them improve electrical efficiency of grinding operations, and optimize energy consumption.

## The future of grinding is sustainable

According to ABB's Marcelo Perrucci, Global Product Line Manager—Grinding, the current production rate of metals and minerals cannot support a global economy with net zero carbon emissions. Electric vehicles, wind turbines and other green technologies rely on copper, lithium, cobalt, manganese, nickel and graphite for wiring, batteries and components. Solar panels use tellurium and silicon within cells. Extraction rates have to be raised sustainably. And grinding machines are key components to achieving that sustainability.



**Marcelo Perrucci**  
Global Product Line Manager —  
Grinding at ABB





GEARLESS MILL DRIVES

# What forward-thinking mines are doing

Mines that have their focus on the future are adopting a number of innovations to meet current and future challenges around energy, productivity, and sustainability.

## Turning to gearless mill drives

ABB introduced the world's first gearless mill drives (GMD) in 1969. These innovative drive systems mounted the rotor poles directly onto the mill so that the mill itself became the rotor of the gearless motor.

Today's GMDs are replacing conventional ring-gearred mill drive systems (RMDs). Such RMDs are currently being used up to 18MW, but operators see the benefit of GMDs even in the lower power ranges since they eliminate ring-gears, pinions, gearboxes, couplings, motor shaft bearings and motor bearings, thus improving efficiency and reliability of the whole system.

Forward-thinking mines are deploying GMDs because they deliver superior availability, reliability, flexibility and efficiency. They deliver the highest achievable power while reducing energy consumption, thereby improving sustainability.

Gearless mill drives also offer the opportunity to reduce mine footprint by having one large mill instead of multiple smaller mills. Gearless mill drives require less material and less physical space, which translates into less impact on the environment.



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## Maximizing reliability and availability—X 6

ABB has six ABB Gearless Mill Drives up and running at the Cobre Panama copper mine in Panama. They allow operators to react to changes in ore characteristics due to variable speed and, by optimizing the process, are more efficient in their use of grinding power. Due to their optimized design, they maximize reliability and availability.

# Forward-thinking mines are embracing digitalization

**The key to driving productivity, sustainability, and efficiency gains in today's grinding operations is digitalization.** Forward-thinking mines are harnessing Industrial Internet of Things (IIoT) devices to support a flexible, scalable and reliable cloud platform. These IIoT devices deliver a range of comprehensive functions that protect mines, regardless of location.

Mines are using digitalization to monitor machine performance to achieve performance goals and achieve sustainability targets. They are optimizing grinding processes with other innovations. GMD delivers tangible benefits over RMD, **including energy savings of up to 3%.**

Installing GMDs often means using less on-site mechanical equipment, and thus a reduced footprint in terms of mechanical space. It is a more efficient technology in terms of energy savings and higher overall system efficiency. **Savings of as much as 3% are possible** compared with conventional solutions—and that means lower carbon emissions and higher cost savings.

## CASE STUDY

### Manufacturing excellence in Bilbao, Spain

ABB's ring motor factory in Bilbao, Spain, is the group's only facility of its kind in the world. At 20,000 square meters, and featuring an assembly area with a lifting capacity of 400 tons, the facility has shipped over 100 motors to over 25 countries to date. All manufacturing processes, from design and engineering to after-sales services, are integrated under one roof. An extensive network of local suppliers, and proximity to the Port of Bilbao, help ABB custom-manufacture each motor to satisfy the most demanding of technical specifications, operating altitudes and operating conditions worldwide.



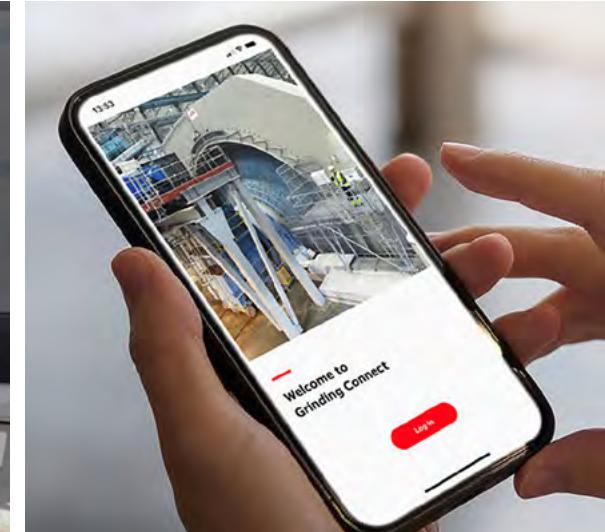
### The future of mining

ABB's Collaborative Operations Center for GMD is in Baden-Daettwil, Switzerland. It paves the way for ABB to develop its digital technologies for the future of mining—ABB Ability™ Predictive Maintenance for Grinding. Collaborative Operations utilizes the ABB Ability™ platform and cloud infrastructure to securely integrate and aggregate data from multiple mine sites. ABB Ability™ Performance Optimization is a smart, automatic monitoring service that tracks the status of a mine 24/7. It connects customers' systems with ABB experts and analyzes the condition and performance from the center. The service links hardware monitoring with secure remote access options and ABB's expert software.

# Forward-thinking mines are leveraging AI & analytics



AI & ANALYTICS



## The future of mining is predictive

The future of mining is predictive maintenance operations, particularly at remote locations. Unscheduled shut-downs and system failures lead to significant losses in production and profit potential. Mining operators with remote sites must mitigate these losses by predicting when maintenance is required, maintaining their assets according to predicted need, not according to a calendar or a failure.

This is why mines are turning to solutions (such as ABB Ability™ Predictive Maintenance for grinding) that analyze system data, assess the current condition of equipment, and apply state-of-the-art predictive methods.

## Seeing the future more clearly

Advancements in big data, data analytics, AI and advanced modeling algorithms are offering mining companies unprecedented visualization and transparency along the entire mine production chain.

Using the ABB Ability™ cloud platform, mining operators are gathering and collating real-time data from sensors in the systems, enabling them to carry out preventive and predictive maintenance from remote locations using machine learning, artificial intelligence and other techniques.

# Mining transformation is creating winners



Move forward with a greater sense of what's happening inside your mill to improve grinding profitability

The more information on the grinding circuit, the more that can be used to drive it to its optimum.

Wireless solutions like the new ABB Ability™ Cascade Monitoring measures online key grinding features. The hardware is easily attached to the shell of a mill and continuously share data to the plant's control system. These features provide an indication of the current milling efficiency as well as if current conditions may be causing excessive wear on liners.



## Close the loop between information and performance

By integrating with Advanced Process Control platform, Cascade Monitoring can be included in close loop optimization strategies to improve milling efficiency by stabilizing shoulder and toe angles.



# About ABB

-  **Innovator in the mining industry since delivering the world's first GMD in 1969**
-  **Pioneer in the digitalization and remote diagnostics for GMDs**
-  **Vast grinding offering (gearless mill drives, ring geared mill drives, drive systems for high-pressure grinding rolls and others)**
-  **Global market leader and local presence in all regions**
-  **Technology front-runner, manufactured the largest GMDs ever produced**



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