

# Transforming mining maintenance

Advanced service solutions for mining and mineral processing

EDUARDO LIMA, JESSICA ZÖHNER, ALIREZA OLADZADEH – Like many other industries, mining has to continuously improve profitability in the face of challenging and rapidly evolving production and market environments. One way to accomplish this is to reduce costs and improve productivity by making long-term efficiency improvements in production assets through the use of advanced maintenance and

service strategies. This is an approach that ABB has long valued. ABB offers a broad portfolio of services from preventive-based and predictive-based long-term service agreements to reactive responses like emergency spare part provision. The portfolio embraces the very latest maintenance technologies, many of which ABB has itself developed.

A service and maintenance strategy that delivers state-of-the-art services is critical for the long-term profitability of any mining company – a fact that ABB has long recognized.

1 Conveyor maintenance is cost-intensive. ABB is currently working on a solution to monitor conveyors remotely.



Productivity in a mining enterprise can be very effectively maximized by the efficient utilization of production assets. This can be achieved through the use of automation, remote operations, diagnostics and production visibility tools, as well as by technologies that provide continuous, real-time information on the condition of mine equipment. A service and maintenance strategy that delivers this is critical for the long-term profitability of any mining company – a fact that ABB has long recognized.

#### A history in mining

ABB's expertise in service and maintenance has evolved over the many years that the company has supplied advanced products and systems to mining operations. ABB products here include:

- Mine hoist systems that transport ore, miners and equipment between the surface and the mine quickly, safely and reliably.

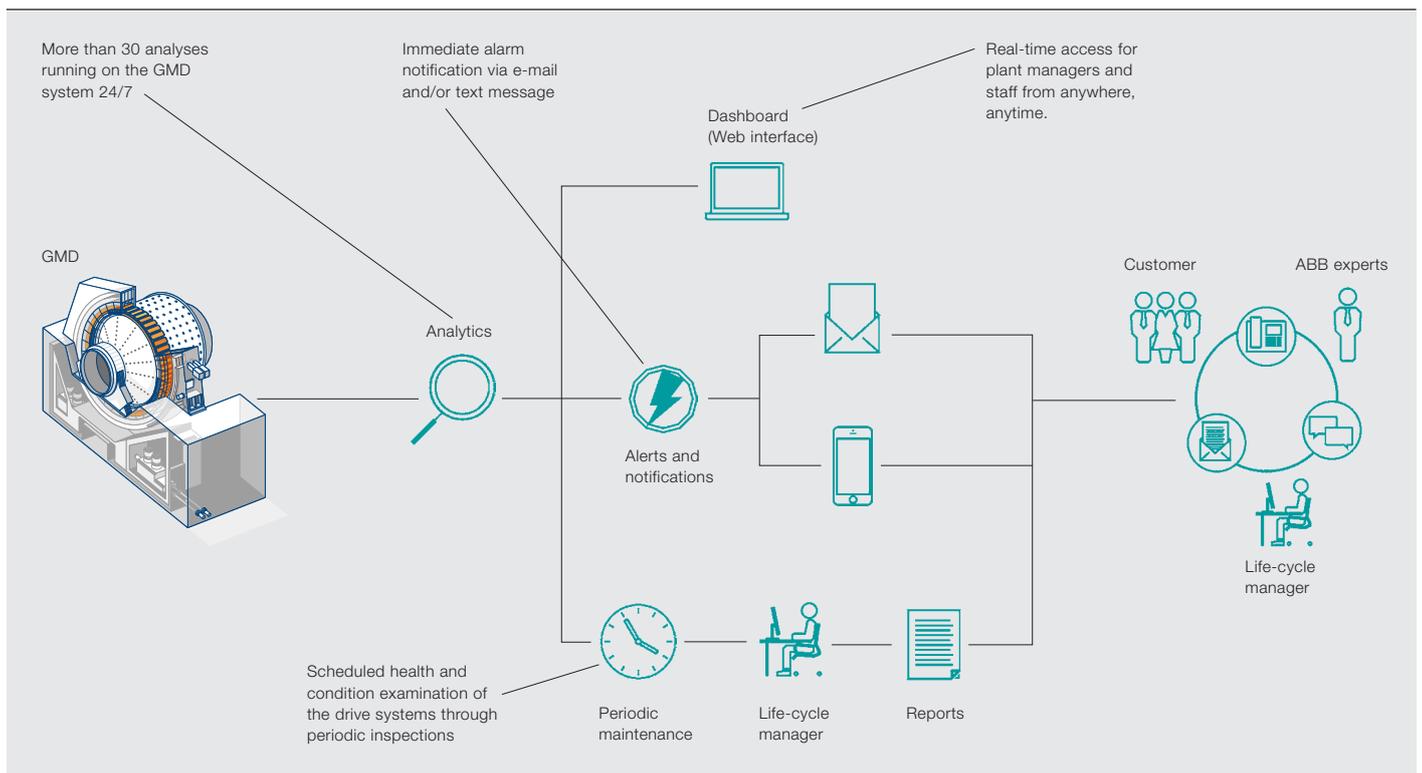
- Variable-speed grinding solutions like gearless mill drives that drive the huge ore crushing mills and meet the highest levels of availability and energy efficiency.
- Variable-speed drive systems that enable conveyor systems, draglines and shovel excavators to operate more cost-effectively and be more energy efficient.
- Complete and fully integrated electrical, control and instrumentation solutions that power, automate and control the entire mine or production site.
- Software products that integrate the automation, electrical and enterprise systems to create a collaborative working environment across the whole value chain from mine to market.

ABB has a huge installed base at mines all over the world: More than 600 mine hoists, 125 gearless mill drive systems, more than 300 conveyor belt solutions, and over 80 complete electrical, control and instrumentation installations → 1. To help its customers maintain these assets in prime working order, ABB offers a broad portfolio of services, from preventive-based and predictive-based long-term service agreements to reactive responses like emergency spare part provision.

#### Title picture

Advanced maintenance and service strategies are essential for modern mining equipment like the sheave pictured.

2 The real-time analyses and diagnostics of the drive system utilize data collected from the control system and drive controller.



The portfolio embraces the very latest maintenance technologies, many of which ABB has itself developed. These include remote monitoring and remote diagnostics; “fingerprints” of plant and equip-

ment and processes. By automatically collecting, analyzing and monitoring the KPIs, users are able to make informed decisions about specific assets and the production process. The objective is to improve availability, process efficiency and product quality, while reducing risk and energy costs.

Uniquely, ServicePort is an all-in-one solution – all channels work together and allow ABB to configure service strategies that align with the customer’s needs.

Another product that ABB has developed specifically for the mining and mineral processing industries is RDS (remote diagnostics services) for maintaining, assessing and analyzing drives in grinding systems (gearless mill drives, ring-gear mill drives, and high-pressure grinding rolls).

RDS consists of three components.

**Remote troubleshooting**

ABB has long offered its customers around-the-clock support from experts (via ABB SupportLine) and remote troubleshooting. These two services are available for most ABB power and automation products in the mining industry including grinding systems, mine hoist systems, plant automation systems, variable-speed drives, and many others.

ABB SupportLine gives customers access to what is probably the most comprehensive and advanced support program in mining. The service provides customers with immediate access to ABB technical support engineers who have the

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ment that pinpoint underperforming assets; and asset optimization services that minimize the cost of assets over their life cycle. By elaborating on some of these service technology areas, a broad understanding of how service and maintenance technology can contribute to profitability can be obtained.

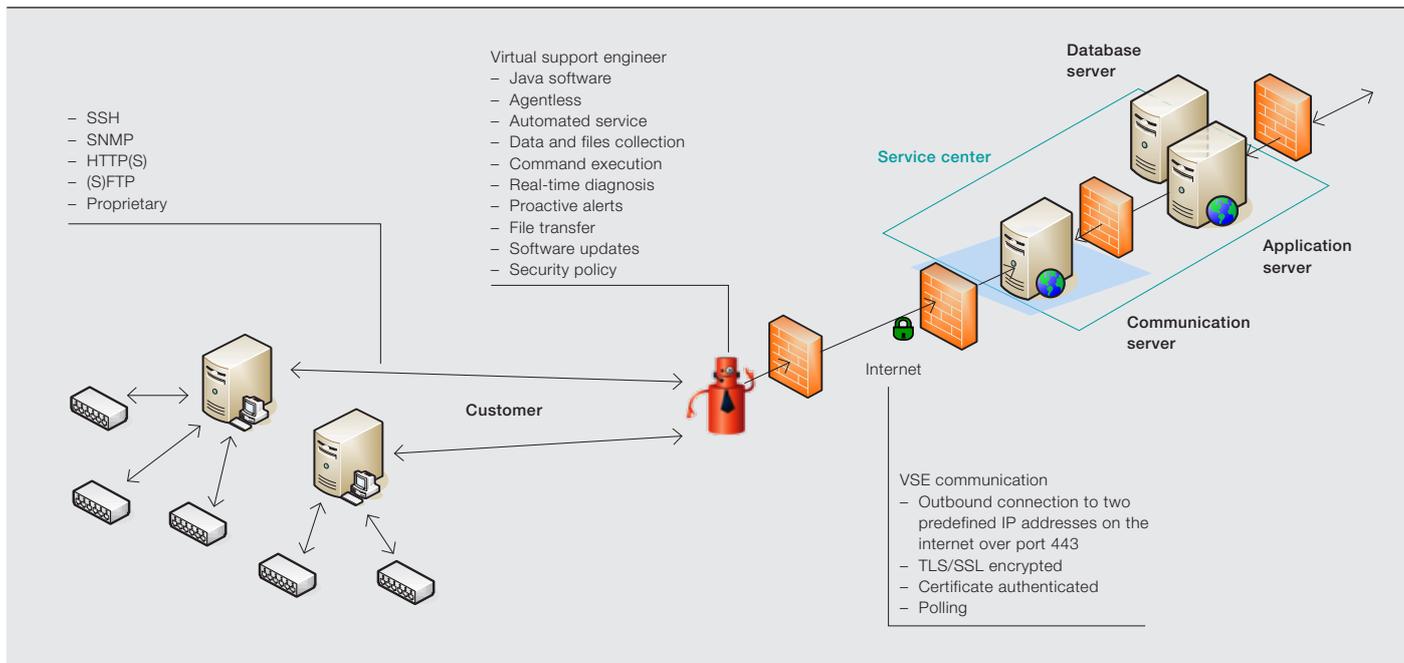
**ServicePort™**

ABB has developed a secure, remote-enabled service delivery platform – ServicePort™ – that allows customers and ABB experts to view, scan and track key performance indicators (KPIs) to ensure maximum performance of equip-

specific equipment or process data to produce relevant KPIs. Performance service channels fall into three categories:

- Equipment performance services monitor utilization and performance of ABB-made products, such as control systems and drives.
- Process performance services diagnose and improve production or business processes, such as loop performance and cyber security.
- Industry performance services diagnose and improve equipment or processes specific to certain industries, including mine hoist systems in mining.

3 The architecture of RDS is developed to ensure the highest security standards for the customer system.



## Remote troubleshooting enables ABB experts to access ABB products through a secure remote connection and troubleshoot the problem at hand.

knowledge, experience and resources to handle the support request immediately.

Remote troubleshooting adds a further dimension to remote support. It enables ABB experts to access ABB products, such as a grinding system or mine hoist, through a secure remote connection and troubleshoot the problem at hand. This speeds support, eliminates travel and allows specialists from different fields to work on a problem simultaneously.

### Periodic maintenance report

This is a scheduled health and condition examination of the drive systems through periodic inspections. The results are presented in a periodic report identifying the condition of the system.

### Condition monitoring

A condition monitoring dashboard is presented that allows customers and ABB experts to access all drive-system operating data in real time → 2.

RDS also has an analytics tool that continuously and automatically assesses the overall operating condition. More than 30 analyses continuously run on the drive system in order to optimize the asset performance and reduce planned and unplanned maintenance. Trends and forecasts are generated around-the-clock by state-of-the-art predictive methods.

RDS is based on a remote access platform that enables a secure connection to the mine site. The platform architecture includes a service center, a local application called visual support engineer (VSE), and field devices. The service center is a Web-application server that functions as the core of the system, acting as knowledge repository, control center and communication hub. The local application (VSE) is a software application located at the customer facility that monitors supported devices and systems. The field devices include any physical device located in the customer network → 3.

All RAP users are managed by strict permissions, data is encrypted and support scenarios are reported. Remote access sessions are controlled by the customer.

### Asset management and optimization

According to technology and industry analysts, ARC Advisory, reactive maintenance is five times more expensive than preventive maintenance and 10 times more costly than predictive asset management. Predictive asset maintenance is triggered by asset condition, rather than a fixed period of time or a number of equipment cycles elapsing. This makes it far more cost-effective [1].

ARC Advisory defines two types of plant asset management (PAM) systems: one for production assets and one for automation assets. PAM systems are defined



as a combination of hardware, software and services that monitor asset conditions to identify potential problems before they escalate.

The logic takes into account process variables or software, nominal manufacturer data, parameters and other technical standards. It is developed using failure

analysis tools such as fault tree analysis (FTA) and a hierarchical diagram of the equipment. The FTA shows chains of different events associated with a particular failure or “top event,” ie, an abnormal system state. It is split into

a logical tree showing the causes of subsequent events through the use of logic gates and branches.

Criticality analysis – a systematic methodology that classifies equipment criticality – can further improve matters by showing which equipment needs to be focused on.

ABB has a large portfolio of power and automation products as well as systems, and this helps deliver a unique capability in asset management and optimization that extends across the full range of mine assets: instrumentation, electrical equipment, control loop monitoring, plant equipment monitoring, computerized maintenance management systems (CMMSs) integration, mechanical and vibration monitoring, and custom asset monitoring.

## Fingerprints

A “Fingerprint” survey can quickly assess equipment performance, maintenance effectiveness, process control optimization, and plant overall equipment effectiveness (OEE). It is typically completed in just a couple of days on-site, in contrast to traditional plant audits that can take weeks or months to complete.

The Fingerprint provides an assessment of how efficiently the site’s process automation and electrification assets are performing and how well production processes are controlled. This information is analyzed off-site; recommendations for improvement are provided; and the business impact of implementing the changes is calculated.

An in-depth equipment-specific fingerprint, such as an electrical and mechanical assessment of mine hoist systems, can also be performed if a wider review is not required.

## Making a difference

ABB has a long and deep expertise in the technologies that power and automate mines and mineral processing sites → 4. Via service agreements, this expertise can assist customers in the mining industry to improve productivity by efficiently utilizing production assets. ABB continually develops new service technologies and products that improve asset performance and mine profitability. By bundling these services and technologies into a tailored long-term service agreement with the customer, ABB is able to offer its entire expertise and act as a strategic maintenance partner.

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## Reference

[1] “Plant Asset Management Systems – Worldwide Outlook: Market analysis and forecast through 2016,” ARC Advisory Group, Dec. 2012.

Reactive maintenance is five times more expensive than preventive maintenance and 10 times more costly than predictive asset management.

ABB covers both types of assets (production and automation) in a single product developed specifically for mining. This proven solution provides real-time monitoring, notification and maintenance-workflow optimization of the automation and plant equipment, as well as of field devices, IT assets and the production process. It brings together in one interface and in the proper context for each category of user – operations, maintenance, engineering and management – all information in the various automation and monitoring systems, thereby providing a composite view of the health and performance of each asset.

ABB’s asset monitor application analyzes the data in real time. This analysis is performed through a customized monitoring logic for each family of devices.