



Prescriptive Maintenance for the Metals and Mining Industry: From Assets to Enterprise

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How Digitalization Provides Value for Metals and Mining⁴

Potential opportunities include:

Throughput Improvement

10%-20%

Yield Improvement

2%-5%

Emission Reductions

15%-30%

Injury Reductions

5%-12%

Digitalization can help boost performance for companies across the metals and mining value chain, as seen with these typical ranges of KPI improvements according to BCG's research.

Introduction

During the height of the COVID-19 pandemic, the metals and mining industry experienced a slowdown, as did many industries worldwide. However, recovery for the industry has been rapid as economies around the world experience a resurgence, creating a spike in demand for raw materials to power those economies forward. The price of commodities, including metals and minerals, are rising.¹ Lithium, cobalt and nickel are benefiting from a surge in plug-in electric vehicle sales,² and the prices of iron ore, copper and steel are skyrocketing.³ Base metals, some precious metals and rare earth elements are also experiencing unprecedented highs.

The economic slowdown resulting from the global crisis has led many companies in the industry to take a closer look at the efficiency of their operations, asset reliability and workplace safety while understanding the critical importance of accelerating the adoption of automation and digital capabilities.

While some metals and mining organizations are already seeing the positive impact that digitalization can have on their business, much of the industry has been slow, even reluctant, to fully embrace digital transformation. According to BCG's Digital Acceleration Index (DAI), metals and mining is approximately 30-40 percent less digitally mature than comparable industries.



Studies show that unplanned downtime increases the risk of an incident by three or more times compared to planned downtime. — Deloitte

Challenges: Accelerated Digitalization, Costly Downtime, Lost Tonnage and Safety Risks

To remain agile, competitive and profitable for the long term, today's mine operators understand the critical need to integrate digital capabilities into their operations as much—and as quickly—as possible. This is especially important given the current volatile and uncertain conditions in which they are operating. While many operators have embraced the digital transformation and the notion that significant benefits can be achieved through this shift, a large gap exists for many operations between the digital strategy set out and executing against it.

At the same time, one of the biggest challenges for operators continues to be equipment breakdowns as well as the subsequent repairs and delays. These asset failures have largely been taken for granted and accepted as part of the mining business. But these breakdowns, which by their very nature happen generally

without warning, often lead to bigger issues impacting the overall process, and resulting in increased unplanned downtime, missed production targets, lost tonnage or potential safety hazards.

Asset Maintenance, Reliability and Availability

Despite comprehensive maintenance efforts in place by some mines, such as inspections and scheduled maintenance, equipment failures are still going to occur. Because the metals and mining industry is an asset-intensive industry, it's essential that operators invest regularly and significantly in equipment and infrastructure in order to achieve an overall high level of asset reliability.

Many mining sites have already adopted digital technologies such as prescriptive maintenance to monitor equipment, predict failure events by providing alerts weeks or months in advance of potential breakdowns and recommend specific actions that can be taken when an event is predicted. These actions might be suggesting an operator make changes, recommending maintenance service and repairs or

automating actions to examine multiple risk and reward scenarios that could be applied well in advance of impending failure warnings. Having earlier advance notice of potential failures can ultimately result in a number of important benefits, including less unplanned downtime, increased cost-efficient scheduled maintenance, and greater overall equipment effectiveness.

How Prescriptive Maintenance Can Help

Mine operators are leveraging prescriptive maintenance to optimize performance in a number of ways:

- **Integrate historical and real-time data** from all parts of the process and facility to generate actionable insights.
- **Predict equipment breakdowns well in advance.** By identifying potential asset failures, it can help reduce incidents of spills—and equipment stops and starts—positively impacting environmental gas emissions and power consumption.
- **Enable efficient spares planning for your equipment** by giving you a clear indication of when you will need spares so you can plan within your supply chain to address the problem and avoid downtime due to unavailability of spares.
- **Automate data collection, cleansing and analysis.**

With more advance warning of equipment failures, mines have more opportunity to mitigate the negative impact of those events, and are better able to identify bottlenecks, improve troubleshooting, stock spares and schedule maintenance.

Consider, for example, a mill that receives early warning of impending failure of a bearing with 60 days lead time. Prescriptive maintenance enables the facility to avert a major catastrophe, saving an estimated \$400K USD in avoided production losses and maintenance costs.

By implementing the solution, they also avoided unplanned downtime and reduced the likelihood of a mishap occurring at the site.

If Not Handled, Operational Issues Will Simply Grow

In highly volatile manufacturing environments, like mining, where safety is a big concern, a small operational issue left unresolved can turn into a huge problem.

The result: A great deal of unplanned downtime, potentially shutting down your entire operation, putting workers' lives at risk and costing millions in losses.

Small Issue ⇒ Lots of Bigger Problems



Worker Safety Risks



Equipment Failure



Missed Production Targets



Lost Tonnage



Low Yields, Margin Capture

Choosing the Optimal Prescriptive Maintenance Solution

There are a number of prescriptive maintenance solutions available on the market, and it can be difficult to know where to begin when choosing the one that's right for your needs. You'll want to ask several key questions, including does the solution provide users with:

- **Quick Deployment.** Does the solution work using your existing data and resources? With the right solution, you can leverage data from past failures, start receiving prescriptive maintenance advice in weeks, not months.
- **Early Detection.** How far in advance does the solution alert users prior to potential equipment breakdown? A solution powered by machine learning and AI can recognize patterns in operating data that predict degradation and impending failure well before it happens.
- **High Accuracy.** Does the solution provide precise failure pattern recognition so operators can act on predictions with confidence?

- **Scalability.** How quickly can the solution adapt to new operating modes and processes? Focus on a solution that can be rapidly deployed on assets big and small, or across an entire mining facility.
- **Easy Configuration, Implementation and Maintenance.** Can the solution be easily configured by your internal team? Consider one that enables users to quickly identify patterns in operating data that are able to predict failure.

The prescriptive maintenance solution that checks all of these boxes is Aspen Mtell®, available from market leader, 40-year-old Aspen Technology, Inc. Powered by AI and machine learning, Aspen Mtell has been a gamechanger for the metals and mining industry, and other industries. Aspen Mtell performs prescriptive maintenance by forecasting degradation and equipment failures, alerting staff well in advance of when a failure could occur, identifying potential causes and the scope of any failure, and providing advice on the corrective action to avoid or mitigate the impending failure. The impact to your operations: increased operational efficiency resulting in improved energy efficiency and reduced emissions.





Prescriptive maintenance solutions can monitor shovels, continuous miners, haul trucks and excavating equipment as well as fixed equipment.

See how metals and mining companies are deriving value by applying the Aspen Mtell prescriptive maintenance solution to equipment throughout the value chain.

1. Continuous Miners

Monitored cutter motors to schedule planned maintenance.

Potential savings: \$300K USD per year

2. Haul Truck

Used machine learning to optimize scheduled maintenance for ultra-class haul truck engines.

Potential savings: 10% reduction in maintenance spend

3. Conveyor Belt

Identified gearbox oil imbalance on startup well in advance of any actual problem occurring.

Potential savings: \$1M USD per failure

4. Crusher Conveyor

Taking early, less-intrusive action decreased the likelihood of a major asset breakdown, saving on maintenance and production costs.

Potential savings: \$500K USD

5. Vertical Mill

Allowed customer more advance time (20 days lead time) to order spare parts and plan regularly scheduled maintenance activities.

Repair times reduced: 30%

6. Pump

Utilized data to replicate the wear pattern of faulty pumps and apply it to additional pumps, demonstrating scalability.

Potential savings: \$2.5M USD per year

Conclusion

The metals and mining industry has reached a maturity level to fully embrace and utilize the digital optimization technologies that are available today. Those who do not adapt and build a strategy to utilize this technology will struggle to compete against those who do. Prescriptive maintenance can quickly bring results to a mining company by improving the use of existing capital assets and eliminating the surprise of unplanned downtime—which has a direct impact on productivity and safety.

Scalable prescriptive maintenance solutions such as Aspen Mtell are adding value to assets, from a single unit or component to a large mill or conveyor system all the way to equipment across the entire global enterprise. The bottom line: AspenTech and Aspen Mtell are helping metals and mining companies operate more efficiently, reducing unplanned downtime and decreasing safety risks while increasing profitability.

Citations

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About Aspen Technology

Aspen Technology (AspenTech) is a leading software supplier for optimizing asset performance. Our products thrive in complex, industrial environments where it is critical to optimize the asset design, operation and maintenance lifecycle. AspenTech uniquely combines decades of process modeling expertise with machine learning. Our purpose-built software platform automates knowledge work and builds sustainable competitive advantage by delivering high returns over the entire asset lifecycle. As a result, companies in capital-intensive industries can maximize uptime and push the limits of performance, running their assets safer, greener, longer and faster.

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