

An aerial photograph of a river delta, showing multiple channels branching out from a single point. The image is overlaid with a semi-transparent blue filter. A dark blue rectangular box is positioned on the left side of the image, containing white text.

Creating the Intelligent Mine

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RICHARD DIERING

Richard Diering is an experienced engineer who started his career in the mining and metals industry in 1999. Skilled in asset performance management, Richard has spent the last few years implementing digital predictive maintenance solutions at various mining operations for Anglo American. He has now joined AspenTech as a Senior Principal Solution Consultant and is passionate about working with customers to help deliver value from the AspenTech suite of APM tools.

How do you define the intelligent mine? What key capabilities constitute the smart mine or mine of the future?

Any mine, regardless of commodity, is typically spread out over a large footprint and is complex in nature. The intelligent mine really centers around the concept of using technology to enable decision support; i.e. centralizing information from across many locations and business processes to reveal useful insights. You have leaders making decisions every day—and despite their best efforts, sometimes they don't have all the relevant information at hand and inadvertently make a choice that costs the business money. The intelligent mine brings all that information together and presents it in a way that supports key decision-makers, wherever they may be. It's all about analyzing and integrating data to make choices that deliver tangible business benefits.

There are three capabilities that serve as the foundation for the intelligent mine. To become intelligent, mines need to:

Capture data from all parts of the process and facilities. The information guiding decisions all comes from process data, but humans are not fundamentally good at processing that data, so you need systems to collect and organize that data into useful information.

Integrate systems to put data in context. Data stored in 50 different standalone systems isn't going to help—you need to bring it together in one place so you can look at it holistically and understand the linkages.

Build strong decision support systems. You can only make good decisions if you're using good data. Yet often, people don't trust technology—fear that the technology will replace them keeps them from using the tools that would allow them to perform their jobs better. Change management has to come into play to get employees to understand that the organization still values people; decision support tools are intended to empower people do their best work.



Why is predictive maintenance an important part of creating an intelligent mine?

Mining is equipment and infrastructure intensive; it requires a lot of expensive machinery that must be maintained and kept reliable, or the business suffers. While chasing the business goal of reliable equipment is important in the mining part of the value chain, in certain cases it's even more critical in processing. High recoveries are generally only possible when the process chemistry is run in an optimal and stable manner—when equipment breaks down, losses occur during the stop and the restart until the process is stabilized again.

Reliability is key to preventing—or at least minimizing—these adverse effects on the business. Traditional preventative maintenance methods, while still suitable for certain less critical equipment, generally cannot deliver the above-benchmark performance required in today's tough economic climate. In other words, despite maintenance teams' best efforts, a purely preventative maintenance-based asset management strategy won't eliminate all possible failures on all equipment. The results are evident all around us—mines continue to experience unexpected and typically costly breakdowns.

This is where predictive maintenance plays a big role—the technology can monitor the asset health of numerous machines continuously and provide early warnings to maintenance teams that allow them to focus on known issues. Predictive maintenance isn't going to eliminate maintenance and reliability jobs. Rather, it helps workers who have tough challenges and are spread thin over big sites to know what to prioritize. When site maintenance teams and predictive maintenance tools work together, mines stand a realistic chance of eliminating unplanned breakdown.

How can a digital solution help mines optimize equipment productivity?

Asset performance management (APM) solutions can help mines improve reliability, availability and uptime while reducing the need for redundant equipment. Often, operations teams plan for lower availability and install 3 machines when they only need 2 or buy 10 haul trucks to make sure they always have 8 up and running. With the right technology, you can achieve benchmark reliability without the need for more people, equipment or spend. Companies can operate at the required production levels and redundant equipment can either be parked up or switched off. This makes a significant contribution to the bottom line.

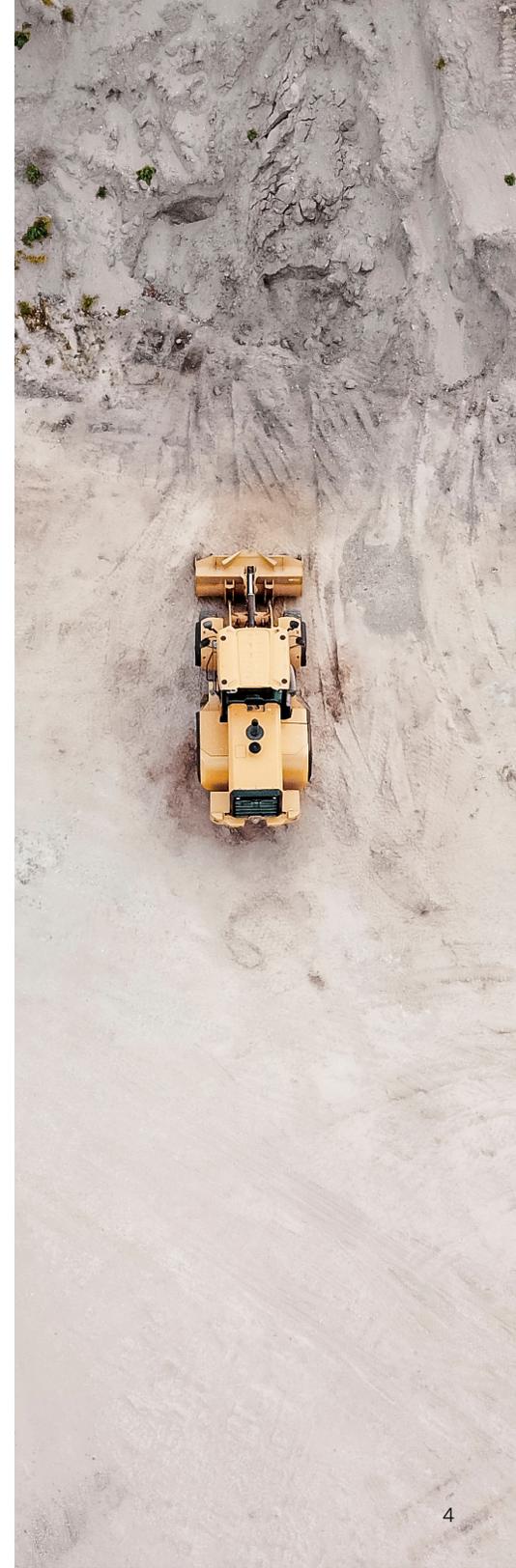
Without the foundational technology such as a data historian, can mines still implement APM solutions that quickly capture savings and increase production?

To develop an effective APM program, certain components must be in place. All too often, organizations try to get away with only partially investing in digital solutions in order to save money, but ultimately this limits the value the technology can deliver.

Successful APM programs draw on data from sensors and other sources, such as your enterprise resource planning (ERP) system, manufacturing execution system (MES), laboratory management information systems and advanced process control (APC) systems. Machine learning and other data science techniques generally don't work that well with only a short snapshot of data available: this is why historians play such a crucial role.

What are some of the most important things mines can do to ensure success with digitalization in general and APM tools in particular?

Once organizations have the foundational technologies in place, I recommend they focus on integration. There are mistakes you can make early on that limit how well the technologies work together. In order to get the holistic view required for decision support, it's crucial that all parts are properly integrated. For example, if your predictive maintenance system can't integrate with your ERP or maintenance system, you're going to have a problem. If your APM tool issues a failure alert and your systems aren't well-integrated, chances are high that no one from the field will act on that alert and a breakdown will still occur. In that case, APM doesn't add any value. Aspen Mtell® integrates with other systems really well—many other APM tools don't do this as efficiently.



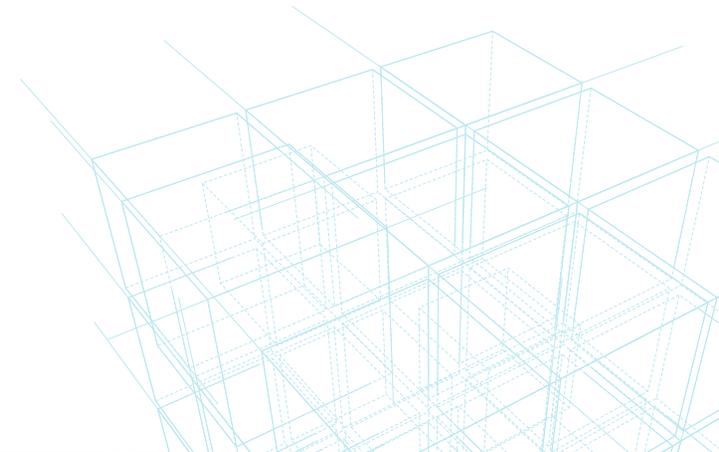
Why should a prospective metals and mining customer choose AspenTech's APM solution?

What makes our offerings unique? How do they differ from other solutions?

First, many mines fear becoming dependent on a particular vendor. They want to maximize APM coverage of their equipment, yet find it cost-prohibitive when relying on vendors and consultants to scale. AspenTech helps customers to implement their first few assets and, in the process, trains personnel to be able to scale the use of the tool themselves. Customers can therefore expand at their own pace thus reducing the time to value. Next, the licensing model is a huge differentiator—AspenTech provides an affordable way for mines to monitor all

their critical assets and processes because customers pay for a site license that can cover as many assets on that site as necessary. Beyond that, the “engine under the hood” is incredibly powerful. The data science is superior to competitors, who typically only offer anomaly detection. Aspen Mtell provides three simultaneous modes: anomaly detection, precise failure pattern detection and user-defined rule-based alerts (which can be useful for detecting system-related issues). In addition, Aspen Mtell is a purpose-built predictive maintenance software, not a generic predictive analytics software that could be used for finance, marketing or other disciplines. Maintenance teams don't have time to be experts in data science, they're focused on

keeping the plant running. With Aspen Mtell, they get a focused user interface that tells them which piece of equipment in what part of the plant is going to break in a specific timeframe—it's designed explicitly for that purpose. AspenTech's solution also allows people in remote locations to look at fleets of assets across multiple sites, really providing the kind of decision support I described earlier as critical in developing the intelligent mine.





***What are some the benefits customers have realized from implementing AspenTech’s APM tools?
How long does it take to see value?***

One of the most tangible benefits from implementing Aspen Mtell is the early warnings of pending failures, allowing mines to avoid weeks of downtime. Most mines have felt that pain before; the ability to proactively prevent breakdowns delivers immediate returns. The combination of diagnostic information and predicted lead time to failure Aspen Mtell provides is extremely useful to the maintenance planning function and helps to optimize maintenance planning and scheduling. Because the software takes over the duty of monitoring equipment all the time, mines that adopt AspenTech’s APM solutions free up people to do more strategic work. While people who have worked at the same facility for many years are initially skeptical, a short time after implementation they report they’re gaining insight they never had before.

Aspen Mtell also allows for post-maintenance validation—as crews finish repairs, they can put machines back online and the software will immediately check for any problems. Seeing if repairs have been completed successfully while work crews are still on site saves time and money. Safety is another area where AspenTech delivers massive value for mines. Traditionally, mines would send humans with hand-held equipment to take measurements on equipment in operation, exposing these workers to risk. Aspen Mtell allows mines to measure and monitor equipment without putting employees in harm’s way.

Accounting and finance teams also tend to be skeptical when we provide examples of customers who have paid back their investment several times over in the first year of implementation—they’re pleasantly surprised when they see ROI far beyond what they expected.



What factors do you recommend metals and mining companies consider in choosing an APM solution?

APM tools are data-driven products—they can't work in the absence of data. Do a thorough assessment of your critical machines and the sensors you have installed to determine whether you have the necessary data in place.

Once you establish that you have the right data available, integration is critical. An APM solution needs to ingest data from your ERP, data historian and various other sources; it needs to be able to send data as well.

AspenTech has connectors that easily integrate with different maintenance systems, historians, ERP solutions and other tools. Consider how well an APM solution is going to integrate with your existing business processes and systems—if it can't integrate, it can't deliver meaningful insight. Many competitors can't provide just one component; they want you to rip and replace additional software to make their APM systems work. AspenTech can offer all pieces of the APM puzzle or just the predictive maintenance one - it's up to you and your business requirements.

Finally, though it can be difficult for engineers to talk about, mines need to consider change management and the human side of adopting

new technology. If staff don't like or trust an APM solution, they're not going to act on its warnings and the organization won't see any value from the investment. To get people on board, it's important to choose an intuitive solution with a good user interface.

You also need to put time and effort into showing people you're not trying to replace them with the technology; you're helping them work more effectively — the software allows them to be focused and efficient. Addressing this human element will be critical no matter what solution you choose.

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 faster, safer, longer and greener.

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