DIGGING DEEPER INTO RELIABILITY

Erik Lindhjem, Emerson, USA, evaluates how continuous condition monitoring is helping mining organisations capture and maintain a competitive advantage.

The tools and strategies needed to run a successful mining operation have changed dramatically from just five or 10 years ago. Mining has always been a complex industry, featuring remote sites and challenging environmental operations that make it difficult to keep equipment running at its best. However, for decades, many organisations were able to rely upon deep benches of trained personnel at their sites to monitor and maintain the most critical assets, and to keep an eye on the essential ones.

Today, that landscape looks very different. In the last few years, experienced mining personnel have been retiring in droves, taking their decades of institutional knowledge with them. Unlike in decades past, experienced replacements have become difficult, if not impossible, to find – particularly for mines operating in remote locations. Gone are the days where a reliability team could count on having people on site who could tell if a conveyor or shovel was malfunctioning based on the sound of its operation.

At best, new staff onsite need lots of extra decision support to help them identify, isolate, and solve problems. At worst, there are no new people onsite, and the reliability team loses more visibility into the health of its assets with each passing day (see Figure 1).

Fortunately, modern technology can help reliability teams close the experience gap and ensure constant visibility into the health of assets, both on-site and across the enterprise. Modern sensors and machinery health software are more intuitive, affordable, and scalable than they have ever been, providing teams with an easy path to continuously monitor asset health, and intervene before small asset problems evolve into costly downtime. Today's forward-thinking organisations are implementing these continuous condition monitoring technologies as part of a boundless automation vision to capture data from a more intelligent field, and then easily turn it into valuable, actionable information at the edge and in the cloud.

Wrestling with walkarounds

Many mines still rely nearly exclusively on physical rounds to ascertain the health of their critical and essential assets. For lean teams, physical rounds are particularly problematic. First and foremost, they are often extremely time-consuming. Whether they are investigating a shovel that is a long way from the maintenance shop, or need to check the many moving parts on a miles-long conveyor, reliability personnel for mining operations frequently spend significant time in trucks moving between assets.

Every minute that a worker spends travelling between data collection points is a minute they could be spending on a more high-value task. Moreover, when the technicians are less experienced, it often means multiple people must spend time performing rounds, making the loss of time even more significant. If a site or plant does not have enough people, or the staff responsible for maintenance rounds are sick or on vacation, data collection – and, by proxy, data analysis – is often delayed or missed. In addition, the more time personnel must spend near operating assets, the more risk is associated with the task of maintenance and reliability, and that risk increases further for less experienced personnel.

In response, today's most efficient mining operations are dramatically reducing the need for physical rounds with modern condition monitoring technologies. Small, wireless vibration monitors are easy for technicians to install nearly anywhere, and they can capture a wealth of asset health data. The best solutions not only capture raw vibration data, they also translate it into intuitive health scores viewable from a user's mobile device. These help them immediately identify which assets are healthy, and which need intervention – whether the technician is in the field, in the shop, or even off site.

Figure 1. While the unique characteristics of electric rope shovels can make monitoring a challenge, Emerson offers specialised solutions for this particular environment.

Figure 2. Emerson's wireless monitoring solutions offer a cost-effective means for keeping even the longest and most distant conveyors running at peak performance.

Continuous monitoring in action

For one organisation running an opencast mine and associated processing facilities in Mexico, the reliability team depended on physical rounds to monitor several conveyors ranging from 50 m to 2 km in length. Covering that distance was complicated and risky, especially when personnel shortages left the organisation with a lean staff on-site. However, downtime events associated with ruptures in the belts often exceeded 24 hr and resulted in massive revenue loss, making regular monitoring a critical task (see Figure 2).

Using wireless sensors and gateways, the team was able to implement continuous temperature and vibration monitoring along the conveyor belts. The reliability team not only reduced the time spent on collecting data, it also ensured data was collected the same way and with the same frequency, regardless of who was on staff. The team is now safer, more efficient, and more effective at keeping critical assets operational, which is a key differentiator over its competitors.

Software delivers insight

While collecting and analysing asset health data are crucial, organisations are finding that standardising the response to this data is equally important. Modern workflow software helps bridge the gap between insight and action, especially for less experienced teams. These systems create consistent, repeatable processes that guide maintenance teams through proper procedures, while meeting compliance and documentation requirements.

In addition, with a workforce shortage and the need to run lean teams, organisations are increasingly finding that expertise on hand is at an all-time low. If users are still collecting data physically, or if their wireless sensors are only sending raw data back to users, less-experienced personnel often struggle to make timely decisions. It takes time and expertise to review and analyse spectrum and waveform data, plus additional time to track and trend the data over time to identify patterns. Small teams rarely have the bandwidth for such activities, so they often go unperformed.

Organisations are beginning to close this gap by selecting sensing technologies that perform basic analysis before sending results to users. Even small, wireless sensors can now translate raw data into intuitive health scores, providing users with a clear indication on their mobile device – green for healthy, yellow for needing attention, red for severe faults – so they can quickly prioritise and react to asset health issues, regardless of their expertise.

In fact, many organisations are taking a further step by implementing edge analytics devices right at their assets for even deeper automatic analysis of health status. Edge analytics devices collect vibration and process data from mine assets, and they then use embedded software analytics to automatically identify the most common problems with rotating machinery, empowering users to skip the analysis and proceed right to intervention in many cases (see Figure 3).

Enhancing operations with edge insights

Software was critical to the Mexico facility's ability to track and trend its asset health. Using industrial software designed with pre-built, industry-accepted analytics, the reliability team was able to quickly and easily transform sensor data into actionable information, leading to better decision-making.

The team could potentially increase its insights and shorten their reaction time by implementing edge analytics devices for deeper monitoring of its conveyors. Edge analytics applied to conveyors could measure and evaluate peak-to-peak vibrations to predict degradation before it slows processes. Even more importantly, the data can be tracked and trended more effectively, helping teams prevent accidental events or loss of production.

Enterprise insights

One element of mining that distinguishes it from other industries is the tendency to operate many different facilities spread out over a wide geographic area. These organisations often need visibility of reliability data at corporate headquarters to make strategic business decisions, but if every mining operation relies on manual data collection and analysis, it is unlikely the corporate office will be able to monitor and evaluate big picture operations effectively.

To address this issue, forward-thinking facilities are leveraging a boundless automation vision to eliminate silos of data to more efficiently and effectively move asset health data from the field, through the edge, and into the cloud – while maintaining critical context necessary for high-level analytics. They accomplish this by prioritising seamless integration between their reliability solutions to ensure data is never trapped through proprietary formatting, incompatible transmission protocols, and other barriers to seamless transmission. Free of the need to move or format data by hand – or worse, travel to the site to collect it – business teams can use automatically-collected data to innovate and streamline operations, driving competitive advantage across their entire fleet.

Figure 3. Teams can access asset health information anywhere from pit to processing using AMS Machine Works on mobile devices.

Prepared for the future

The mining operation in Mexico implemented its continuous monitoring solution with a boundless automation vision by selecting wireless transmitters and analytics software that were integrated out of the box. The team knew it did not have the staff or the time to engineer and maintain a complex web of custom connections between a wide array of disparate solutions. Instead, it opted for technologies with proven performance that could communicate automatically.

Not only does the team now have seamless data mobility between its wireless sensors, mobile device dashboards, and on-site analytics software, it has also built a foundation for future technology expansion to an enterprise asset management platform and enterprise analytics software. It will thus be possible for the team to drop in seamlessly integrated versions of such solutions without extra engineering effort when it is ready to drive its facility insights to the enterprise cloud.

Build a technology trajectory

Because mining operations are typically remote, many have learned to be quite self-sufficient over their decades of operation. Today, however, self-sufficiency must go beyond maintaining a large staff, and instead must focus on ways to do more with a lean crew of less experienced personnel. Fortunately, organisations ready to tackle this challenge can do so with the many continuous condition monitoring technologies available to help teams turn data into actionable insight. Moreover, teams willing to be thoughtful about their technology implementations can build a foundation for seamless data mobility, not just at the site level, but across the enterprise. Such solutions are key to locking in competitive advantage in an ever-widening global marketplace.