

A helping hand from wireless automation

Bob Douglass, Innovative Wireless Technologies, Inc., USA, explores how wireless automation can help improve tailings management.

Tailings management is an important component of mining and production that has many requirements with competing priorities, such as: meeting regulations, following best practices, minimising environmental impact, reducing risks, maintaining safety, and considering long term effects of decisions made each day. Modern monitoring and automation technologies with flexible implementation strategies can help accomplish all of these requirements, while saving money and reducing risk. Operations can even yield additional earnings from improved tailings management.

Risks and costs

Some of the risks and costs of improper tailings management are clear, whereas others are hidden. Regulation non-compliance is an obvious risk that carries fines and other less than desirable impacts. No one wants to pay fines or take on unnecessary liability risks, but there are also some other not-so-obvious risks and costs.

Utilising existing labour resources to perform periodic inspections of remote equipment and processes is a common occurrence within tailings management. While it may seem cost effective to make use of existing resources to perform routine tasks, there are unseen side effects. Skilled labour is a critical resource, and it should be used effectively in order to maximise profit and reduce downtime. Limiting professional growth of employees can also result in unplanned workforce changes if they seek other employment.

Not only are manual inspections a potential inefficiency for mine production staff, but they are also an inefficient approach to tailings management. Sending personnel to remote parts of the site to check on operations lengthens the time to detect and respond to unexpected tailings events. These unnecessary delays increase the chance for smaller issues to grow into more serious events, which may ultimately result in fines and cleanup costs. Longer response times could also impact production, and may require critical labour force to help with the response instead of working on production.

Immediate response times can therefore reduce the likelihood of incurring hidden costs.

Automation assistance

Automation, sensing, monitoring, data logging, and alarm notification have all been around for a long time. The most common challenges with these solutions are the complexity



and cost. Fortunately, recent advancements in the industry, combined with new technology offerings, have reduced both cost and complexity. Sensors and automation hardware have come down in price, and communication systems are available that self-configure in order to simplify the installation and make deployments less



Figure 1. This remote wireless node sends continuous data more than 20 km.



Figure 2. A wireless node installed at an operation's pump-back station allows for remote monitoring.

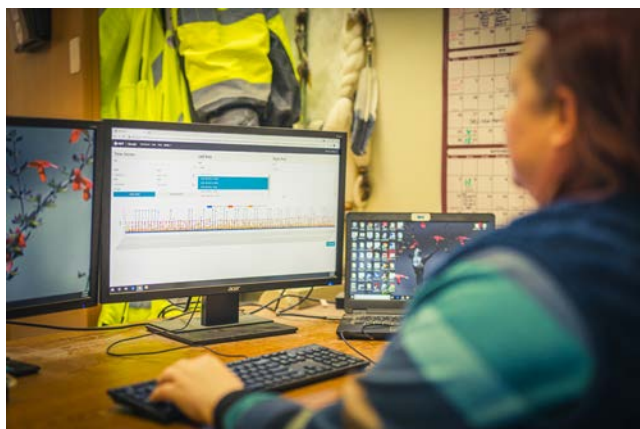


Figure 3. Valuable data from continuous monitoring resulted in immediate company savings.

technically demanding. Streamlining these automation processes can reduce or eliminate customisation costs. Here are some automation features to look for:

Wireless

Running wires is expensive, and in most cases not even practical to consider. Remote areas require long distance power and data wiring which increases to the initial and ongoing costs to maintain. Accessing equipment in isolated areas can also create safety concerns. Wireless solutions are more common and affordable than ever, and some of the newer wireless approaches are very desirable to consider.

In a traditional wireless sensor network, each sensor device, or 'node', communicates directly back to a central point that collects and consolidates the data. In this hub-and-spoke architecture, the range of the network is limited to the distance each wireless sensor node can directly reach back to the central point. A more advanced wireless approach is a 'mesh' network, which allows the coverage area of the network to go beyond the transmit distance back to the central point. A 'mesh' network does this by allowing sensor nodes to pass communications through each other on their way back to the central point. In a mesh network, every node is a repeater, which not only allows continual expansion of the network, but also improves reliability by adding redundancy to the communication paths.

Utilising a mesh network for automation can provide a significant cost savings. Since all of the components communicate through each other back to a central point, large arrays of automation components can be monitored with only a single cloud uplink device. This reduces recurring monthly communication costs and simplifies complexity.

Flexible

The world is ever-changing; businesses change, resources change, the environment changes, and regulations change. A critical component in any automation system is the sensors, and likewise the ability to change types and brands of sensors when needed. An automation system that can work with a wide variety of sensors is therefore advantageous. A 'sensor agnostic' solution can support legacy sensors, modern bus sensors, low power sensors, and many times sensors that have not been invented yet. There are new specialty sensors such as pond levels, inclinometer readings, piezometric pressures, weather conditions, security monitoring, and more. Maximising the flexibility ensures investments in automation systems can scale as far as possible into the future.

Scalable

In addition to the unknown sensing needs in the future, there are also unknown growth potential initiatives to plan for. An automation system capable of scaling will allow future growth and the ability to support expanded requirements as needed.

What needs to be scalable? Everything. The number of sensors, the number of communication nodes, the total size of the system, the cloud communication capacity, the cloud server capacity, and so on.

Multifaceted

Automation encompasses many things. There are data loggers, telemetry systems, programmable logic controllers, SCADA systems, Internet of Things (IoT) solutions, and more. Some of the terms can be confusing. Focusing on solutions that include as many functions as possible will help to ensure that an investment pays for itself. Limited capacity systems may fall short of meeting overall requirements, so look for a complete system that can sense, monitor, control, log data, provide web access, smartphone access, and perform alarm notifications. A system that can provide insight when things are normal and analysis when the unexpected events happen will provide the most benefit. Having access to data leading up to an event also allows post-event analysis and can result in procedural changes to prevent similar events in the future.

One of the typical features often overlooked is the control aspect of a remote automation system. A control response can have significant cost savings. Knowing when an event occurs is critical, but having the ability to respond immediately provides an elevated benefit. Look for a system that can perform switching control activity, especially remotely, in order to potentially counter the unexpected event with pump activity or other controls responses before anyone can be onsite to respond.

Case study: Wyoming, USA

One example of a tailings management cost savings and benefits is a trona mineral mine in Wyoming. A recent tailings management overhaul provided solutions to many of their costs and risks. The operation installed a modern, mesh-based

wireless automation Envök system from Innovative Wireless Technologies, and the benefits were numerous.

The new automation system provides custom reports, which enables them to document pump flow over time, and provide validation to hydrogeologists' modeling of ground water flow. Further, since the network and remote data are available 24/7, any disruptions in the pump back wells' operations are immediately noticed, saving the company valuable response time, personnel time, and labour costs.

In addition, the mine now has complete data sets to present to Federal and State environmental regulators. Since the turnkey system is easy for mine personnel to manage, it is now able to easily show that its pumps were running effectively, demonstrating to regulators its due diligence in tracking harmful emissions, and showing the direction and size of the plume.

As an added bonus, the re-evaluation of their tailings management approach also resulted in an improved method to add new mineral recovery component to their tailings management. This provided a new increase in their product yield, resulting in a direct financial benefit.

Conclusion

Inefficient management of tailings can be responsible for overspending in assorted areas. Proper planning, efficient designs, and making use of the latest automation systems can reverse that. Making use of a modern automation system can save money, protect the efficiency of skilled labour workforces, and provide reporting data to ensure proper compliance. **GMR**