Artificial Intelligence Case Study

CASE STUDY: MONITORING THE HEARTBEAT OF MINING AND METALS PRODUCTION

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People for Process Automation

Summary

- Kanmantoo Copper Mine, owned by Hillgrove Resources in South Australia
- This mine used smart sensor technology to increase production potential by raising ROM bin capacities and to reduce maintenance costs by reducing operator time on site.
- To optimize fill levels, existing radar level sensors had to be relocated to new positions and modified to include a simple self-cleaning system using compressed air.
- The mine installed self-regulating sensors to successfully detect and remove dust via air purge from sensor antennas before measurements are compromised.

Self-Monitoring of Devices to Reduce Costs

Imagine a mineral production process where devices have their own heartbeat: they would realize when there is the occurrence of dust build up and would signal the need for cleaning or run an automated sanitation process. Or imagine large tanks full of biomass fuel, used to lower carbon footprints and burned in smelters and kilns: the heartbeat of the sensors monitoring the media levels, pressures, temperature and flow would recognize typical handling problems and changes in the media like excessive foam, sticky build ups (all which would affect accurate or repeatable measurements) and start immediate countermeasures.

If your technical sensing equipment has self-verification functionality, it behaves like an additional and experienced maintenance team with a sublime knowledge of the mineral production process and the ability to react to production anomalies to reduce costly downtime. Sensors capable of monitoring their own performance against initial calibration and setup remove the uncertainty that there is a process problem or sensor issue. If a sensor knows that it is working against initial specification, only then, will a process problem and not a sensor malfunction be detected.

Self-monitoring measurement sensors create a trust in the process and enable the maintenance and production teams to run processes smoothly while reducing time spent checking for malfunctioning sensing equipment. The devices will tell you directly if a problem occurs. This is a first step from smart Sensors to the Internet of Things. As a first step from smart Sensors to the Internet of Things, the devices will tell the user directly if a problem occurs.

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Objectives

Kanmantoo Copper Mine, owned by Hillgrove Resources in South Australia, wanted to take their first step into the exciting world of IIoT and test smart sensors. They had two clear objectives:

- To increase production potential by raising ROM bin capacities
- To reduce maintenance costs by reducing operator time on site

Applying the Technology to Resolve Challenges

To accomplish the objectives listed above, Kanmantoo Copper Mine wanted to maximize fill heights in ROM bins used to store unprocessed copper ore. To optimize fill levels, existing radar level sensors had to be relocated to new positions and modified to include a simple self-cleaning system using compressed air. In theory, this was a way to avoid excessive dirt build up on the sensor. Dust build-up on the sensor face negatively affects measuring signals emitted and received by any level transmitter–a clean and fully functioning sensor is a critical factor for precise measurements. Under constantly dirty conditions, conventional radar and ultrasonic level sensor would need to be regularly cleaned, sometimes every hour. It would be time wasting for the maintenance personnel and the ROM bin would be stopped, which leads to costly downtime.

The Australian Copper Mine wanted to avoid expensive mechanical changes and decided to use a self-monitoring radar level transmitter with an integrated diagnostic function. This function monitors the extent of dirt build-up in the measurement horn antenna and reports it back to the control room to alert personnel of the need to clean the transmitter. One maintenance key performance indicator (KPI) was to reduce personnel time by on site by 10%.

Sensors also feature cleaning assemblies or mechanisms which are rarely used. In the case of the Kanmantoo Copper Mine, a compressed air hose line connector, was used to blow dust out of the measurement sensor antenna. Dirt buildup was detected and before measurement integrity is affected, the compressed air hose line completed an air purge removing the need for manual cleaning. The mine reached their objectives by installing self-regulating sensors.

Many sensors have this kind of self-monitoring heartbeat. Heartbeat technology intelligence tracks any negative performance of the device due to abrasion, corrosion, or sticky build-up.

Standardization

The chemical industry has many electrical diagnostic standards. The mining sector would be well advised to adopt these best practices. Many sensor manufacturers build their product to the standards of the largest association known as NAMUR.

NAMUR, the "User Association of Automation Technology in Process Industries", is an international association of user companies (established in 1949) and represents their interests concerning automation technology. NAMUR numbers over 150 member companies. The achievement of added value through automation engineering is at the forefront in all NAMUR member company activities. NAMUR conducts a frank and fair dialogue with manufacturers.

NAMUR represents several thousand process control technology specialists, with around 300 participating almost in 40 working groups involved in the following areas:

- Measurement
- Controls
- Automation
- Communication

These process control technology specialists cover the entire plant life cycle from:

- Planning
- Procurement
- Installation
- Operation
- Maintenance
- Decommissioning

Conclusion

Many smart sensors offer clear diagnostic messages according to the Namur NE107 standard which tells operations what needs to be done to maintain the plant economically based on necessities. As the sensing devices run their own diagnostics, proof tests are only necessary in maximum extended cycles. Furthermore, the automatic generated protocols organized by the heartbeat technology without process interruption support safety related documentation according to international standards requested by institutions.

For a future-orientated predictive maintenance the heartbeat of the instruments offers parameters to monitor the performance enabling process optimization.

About the GMG Artificial Intelligence Working Group

The mining industry is increasingly using artificial intelligence (AI) as a tool to optimize processes, enhance decision-making, derive value from data, and improve safety. The AI Working Group aims to identify the current challenges within the industry, define long-term collaborative solutions, drive innovation, educate on AI-related concepts and technologies like machine learning, keep up with the rapid advancement of technologies, and share best practices and knowledge. The group is a global network of subject-matter experts, operators, suppliers, leaders from inside and outside the mining industry, and those interested in learning more about applying AI in their operations. Do you have a case study you would like to share? Contact us.

About GMG

The Global Mining Guidelines Group (GMG) is a network of representatives from mining companies, original equipment manufacturers (OEMs), original technology manufacturers (OTMs), research organizations, academia, regulatory agencies, consultancies, and industry associations who collaborate to tackle the challenges facing our industry. GMG aims to accelerate the improvement of mining performance, safety, and sustainability by creating guidelines and white papers that address common industry challenges, facilitating collaboration and expanding the industry's knowledge base. GMG also hosts and supports events that bring