A solution to the high cost-impact of dislodged panels in iron ore mining

Screenex® panels from Schenck Process are recognized as a specialist solutions for screen media in the mining and minerals processing industries. However, in tough applications such as iron ore mining, even the best screen panels can become dislodged in the production process. Schenck Process worked with Ramp RFID, an Australian company specializing in wireless tracking, to create a solution to this challenge. It was trialled and put into operation by Rio Tinto Australia.

Schenck Process is a global market leader in the mining supply industry. We design and custom-build modular screen panels for all mining applications, marketed under the Screenex® brand.

The company's services to the mining industry go way beyond product supply. "We assist in all processes from planning through the construction of plant sections and reliable controls, and their connection to data systems," according to Martin Schuetz, Product Manager, Vibrating Screens. "While Screenex® panels succeed where others fail, we recognize that it is imperative for a plant operator to be in a position to take decisive action before any problem results in losses. We therefore sought to build a solution that would pay for itself by preventing stockpile contamination and downtime."

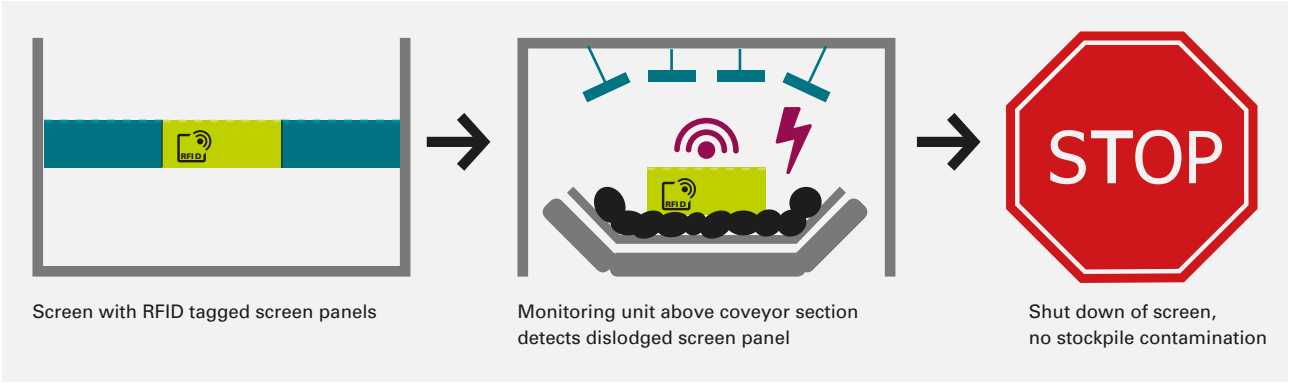
CHALLENGE

Panel failures occur infrequently on site, even under the harsh conditions of iron ore processing, but they have a high impact in terms of lost output, delays in production and most significantly, the contamination of stockpiles.

Contamination in a stockpile means that the material will need to be re-screened to meet shipment specifications. Consequently, this results in significantly increased costs of production.

In addition, disruption to the production process itself can occur if a screen panel becomes totally dislodged from the screen and travels along the product conveyer.

It is extremely unlikely that any panel dislodgement will be detected by human means during the production process until it is too late. This is especially true in an environment such as iron ore production, where dense and moist materials are being processed at high speeds, obscuring the condition of screen components. Therefore, mining enterprises such as RioTinto Australia have been looking for a technical solution. Schenck Process likewise identified the need for a solution that would enable its customers to detect when a panel becomes dislodged from the screen.



Screen with RFID tagged screen panels

Monitoring unit above coveyor section detects dislodged screen panel

Shut down of screen, no stockpile contamination

SOLUTION

Schenck Process engaged Ramp RFID, to collaborate in finding a solution to the problem of dislodged screen components. Ramp had already demonstrated considerable experience and expertise in delivering successful, cost-effective RFID (radio-frequency identification) solutions in the mining sector. Schenck Process is committed to finding predictive and preventive maintenance approaches, which allow mining operators to make an intervention before a problem causes actual disruptions to production.

The two companies developed a solution utilizing EPC Gen 2 UHF passive RFID technology that provides close to real-time monitoring on the dislodge of the screening media, with a fixed RFID read point strategically positioned above a conveyor section.

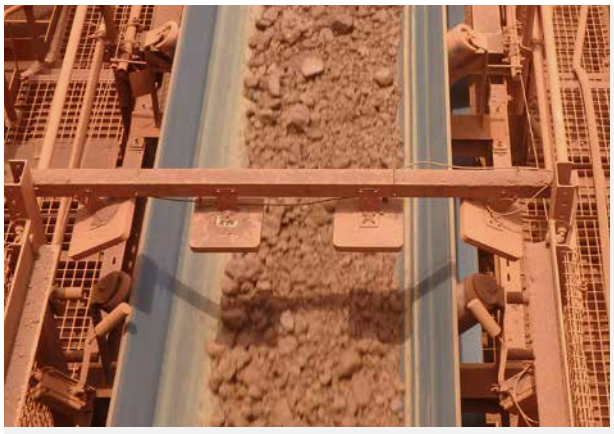
The solution is highly robust, modular designed panel that does not require any maintenance: each RFID tag is fully encapsulated within the panel, which means that no further care needs to be taken and the RFID chip will endure the panel's full product lifecycle.

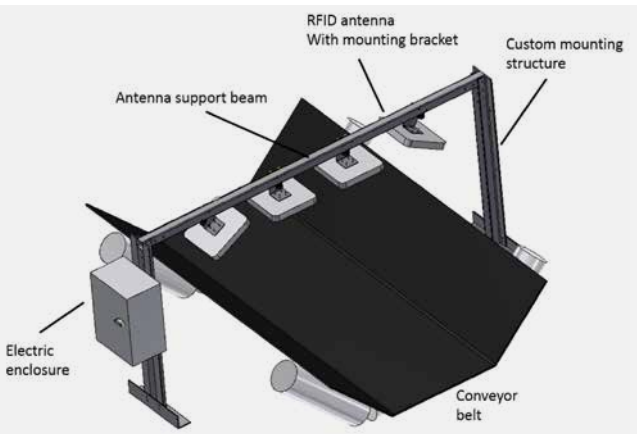
The capture of asset tracking data will also provide the basis for future integration with condition monitoring solutions.

IMPLEMENTATION

A prototype RFID detection unit was installed on conveyor belt at a Rio Tinto iron ore processing plant in late 2013. It was used for test-work purposes over the following year. The prototype unit has since been converted for large-scale operational use by the plant's metallurgy, maintenance and electrical departments in collaboration with Schenck Process and Ramp.

An array of antennas is installed on the conveyor, all of which are connected to the RFID reader enclosure, which in turn interfaces with Rio Tinto's PLC. If a panel is dislodged during operation it typically reports the screen oversize. When this occurs the panel travels along the product conveyor out of the screen-house and under the antenna arrangement.





These images show the antenna array at the exit from the screen house. The antennas detect if a screen media panels becomes dislodged.

The antenna detects that a screen panel has been dislodged and the appropriate action can be taken to prevent stockpile contamination.

RESULTS

In the application at the Rio Tinto plant a detection rate of approximately 90% through a thick (up to 400mm) layer of moist iron ore was achieved. Tonnage on the conveyor was in excess of 4000t/h with the conveyor belt moving at approximately 4.5m/s. Because of the high costs of reprocessing iron ore, in most cases the unit cost of the solution in similar plant conditions will be amortized with the prevention of the first incidence.

NEXT STEPS

While the primary purpose of the Schenck Process screen panel tracking system has been demonstrated, there are a number of potentially significant secondary benefits. Schenck Process envisages that the panel manufacturing and installation information, which can be programmed onsite when panels are installed and removed, could also be used to map the wear history for each individual panel location. It could also provide other useful information such as inventory control including automated reordering of panels and optimization of on-site stock levels.

RFID detection units placed at strategic positions within the plant in combination with polyurethane encased RFID tags could also be used to assess the time-based performance of material travel from the mine into the plant also capturing the duration on stockpile.

Such functions offer the opportunity to reduce operational costs dramatically (for example through preventive maintenance, surveillance, optimization of shut cycles and more effective planning of inspection intervals).

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