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Automation and remote monitoring improve conveyor-system efficiency and increase PdM effectiveness.

Remotely Increase Conveyor Reliability

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FROM THEIR CONCEPTION, conveyors were designed to automate bulk handling and make production faster, less labor intensive, and safer. The scale of modern operations can involve dozens of conveyors transporting millions of tons of cargo through a labyrinth totaling miles of belting. Physically inspecting a system is important but can be time consuming, and access to a running conveyor is (and should be) limited by design for safety. In the face of this reality, it's a natural progression to further automate.

In the past century, automated monitoring systems have been introduced such as load sensors, automatic shutoff switches, and fire-detection systems. Still in use today, these are reactionary systems that are triggered by indicators once a problem has potentially reached a critical stage, such as a drifting belt or a fire. Although these improve workplace safety and prevent larger catastrophes, they do not prevent downtime or detect causes of problems.

PREVENTIVE, PREDICTIVE MAINTENANCE

Modern remote-monitoring systems collect data and provide real-time status needed for preventive maintenance (PM) and predictive maintenance (PdM). This data helps inform system efficiency improvements and avoid unscheduled downtime to reduce manual labor and ensure maximum performance. Monitoring systems are an essential component of making PM and PdM more effective.

PM is maintenance performed on a regular schedule to reduce the chances of equipment failure and workplace injuries. This includes cleaning up spillage, changing dust filters, and swapping out worn idlers. PdM uses data to identify potential issues such as worn equipment nearing the end of its service life, abnormal temperature

A cargo monitor can provide real-time performance data and communicate with other equipment.

changes, and material buildup in choke points.

PM and PdM can often fall by the wayside in the face of tight maintenance schedules or staffing issues. One bad weather event or labor shortage can derail even the most organized maintenance plan. However, to improve production and workplace safety, operators can maintain a sustainable workflow using new technology solutions.

SAFER MONITORING

There is rarely a time when personal inspection of any system component is not needed. Walking along a conveyor system and around a transfer point allows all senses—looking, listening, smelling, and feeling (vibration, shaking)—to help experienced operators diagnose issues. However, personal inspection is labor intensive and there is always the chance that exposure to a moving system can lead to workplace safety issues.

The smell of rubber, the presence of smoke, and unusual noises make any operator want to inspect further. However, the simple act of bracing against a stringer to peer under a conveyor can cause incidental contact with the belt and opening an inspection door can leave the inspector vulnerable to flying debris.

Remote monitoring supports keeping schedules on track by offering data through either logistical software or an online app that tells supervisors and managers when potential issues might arise. Combining scheduled preventive-maintenance tasks with remote-monitoring predictive maintenance will eventually become the standard approach. Automated monitoring is much more sensitive, reliable, and faster than human inspection.

There is also the preventive factor. Sensors digest vast amounts of data and provide information to operators, allowing them to prevent major issues, rather than react to them. Idlers can be swapped out before they seize, and cleaners replaced before they cause belt damage, mis-tracking, or fires.

IMPROVED EFFICIENCY

Safety should be top-of-mind for any operator, but a capital investment in monitoring technology will also have a positive impact on production and efficiency. The most common conveyor-specific monitoring devices include cameras that provide an overall view of conditions. Operational sensors can also monitor

equipment conditions, and flow sensors provide important data regarding volume and efficiency.

Position indicators are intuitive sensors that remotely monitor the belt-cleaner position and remaining blade life to improve cleaning efficiency and reduce labor. Estimating when blades need changing is often a guessing game that, if left too long, could lead to expensive belt damage. These systems also warn when a blade is no longer in contact with the belt due to wear, high temperatures, detachment, or a pull-through condition, helping to prevent a catastrophic failure.

Position indicator alerts are also provided automatically when:

- a blade change is required
- re-tensioning is needed
- a cleaner has been backed off the belt
- an abnormal condition occurs
- a high-temperature condition is detected.

Load sensors monitor whether there is a load on the belt and the approximate weight of that load. An empty belt is an indicator of ongoing maintenance, unintended production disruptions, or flow issues. Load sensors also communicate with automated tensioning systems so the unit can pull the blade away from the belt when there is no cargo. Running a blade on an empty belt can reduce blade life, degrade the belt face, and create potentially dangerous friction heat and static.

Flow indicators, or "plugged-chute detectors," can alert operators to the need for maintenance. With machine learning and logistics software, they can automatically activate flow devices such as vibrators or air cannons to disrupt stuck material and resume normal flow. This prevents common unsafe clog-clearing work such as banging on the side of chutes, poking the clog from below with a tool, or entering a vessel to dislodge accumulated material.

BEYOND REMOTE MONITORING

New technologies are moving beyond monitoring to making system changes without human intervention. For example, an autonomous belt-cleaner tensioning system continuously monitors and adjusts proper cleaner tension. The device ensures proper tension to optimize cleaning performance and reduce labor, while improving safety and reducing the cost of operation. Prior to the new design, belt-cleaner tensioners had to be monitored and adjusted manually, in some applications daily, so they would maintain optimum pressure and carryback removal.

Position indicators improve efficiency and reduce labor by monitoring belt-cleaner position and remaining blade life.

Aside from providing performance data, custom-developed apps deliver status updates and equipment alerts to operators, based on specific data-driven criteria. Also, reviewing the capability of the sensors with remote-monitoring equipment helps identify other actions that may be needed to better prevent problems.

Remote monitoring is not new, but it's constantly changing and innovating with the goal of improving efficiency and workplace safety. Although humans will always be needed in some capacity, interaction with the system should be limited to an as-needed basis, and remote monitoring is the best solution to achieve that goal. **EP**

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