Electric Rope Shovel Monitoring

Apply Online Condition Monitoring to Move Toward Zero Unplanned Downtime
Unplanned downtime can be both risky and expensive

The mining pit is an inherently dangerous environment. The daily interaction between man and large, moving machinery creates an environment of ongoing risk. Add to that the unexpected shutdown of an electric rope shovel and the result is a real threat to both personnel safety and production goals.

The severe duty motors and complex gearboxes typically required to operate a shovel puts it at constant risk of breakdown. Something as common as sweeping a wall can break teeth in the gearbox and bring your production to a standstill. Keeping spare parts on hand is cost-prohibitive; and if a hoist or swing motor goes out, you’ll need a crane – and at least one entire shift – to replace the part.

The time, effort and money you spend to secure the parts and expertise to quickly fix the shovel will be far less than the value of your lost production time. Personnel will be pressed to move quickly to complete the necessary repairs which can potentially put them in harm’s way. Even if the repairs are completed without incident, the rushed efforts to get the shovel operational can raise the likelihood of mistakes and introduce new problems. If a swing drive is improperly installed or a hoist motor aligned inaccurately, it won’t be long before your next costly unplanned shutdown.

Moving from unplanned to planned downtime on complex assets

Everything on a shovel is subject to failure, and eventually you will experience a breakdown. The impact of that failure can be significantly reduced by monitoring the condition of key shovel components – the crowd, hoist, and swing drives. Traditional periodic data collection methods are of some value, but they place personnel in harm’s way as data must be collected on an operating shovel under special test conditions. And periodic methods can easily miss problems that can quickly unfold between collection times. Ideally, monitoring of these drives is performed during normal operating conditions. However a shovel’s very low RPM operation under heavy and constantly changing loads presents a unique challenge to most monitoring technologies.

The CSI 6500 has a proven history of monitoring critical rotating equipment in a wide variety of applications. Emerson technology enables problem detection within the unique vibration characteristics of rotating equipment — characteristics found on many types of ore extracting assets, including the electric rope shovel.
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**What is the real price tag on a day of production in your pit?**

If you aren’t monitoring your electric rope shovel, you are operating every minute with the risk of unplanned downtime.
There are a variety of mobile mining assets available in the pit — each with unique condition monitoring needs. On an electric rope shovel, the CSI 6500 monitors the hoist, crowd, and swing drives for developing faults. Shown here is a closer look at the types of faults identified by monitoring the swing drive.

**Swing Motor**
- Imbalance of Rotor
- Shaft Misalignment
- Looseness
- Bearing Faults
- Stator Issues
- Broken Rotor Bars
- Improper Assembly
- And more...

Above Floor
Advanced technologies for understanding machinery health

Changing vibration levels don’t always mean the machinery health is changing. Collecting vibration data in context with machine operating conditions is essential to accurately diagnose the health of the shovel. By applying an approach called adaptive monitoring, the CSI 6500 adjusts the monitoring strategy based on changing machine conditions, such as load or speed. When these conditions occur within a specific range, data is acquired and stored. Trending of the data, analysis and alert levels are all based on similar conditions. With adaptive monitoring, you’ll also identify those faults that occur under abnormal operating conditions.

The CSI 6500 uses a unique processing methodology called PeakVue™ technology, which recognizes increasing stress waves during the monitoring process. This provides earlier identification of fault development in mechanical equipment compared to standard vibration analysis techniques. PeakVue technology detects — even at very low RPMs — anomalies that may go unnoticed with traditional methods.

The combination of adaptive monitoring and PeakVue technology enables the CSI 6500 to capture data during stage testing and normal shovel operation. This flexibility delivers unprecedented insight into the operating condition of your most critical pit asset. Analytical data is available both on board the shovel and can be integrated with other systems for remote analysis. From both in the field and further away, you can easily identify and monitor developing faults and schedule for repairs during planned maintenance.

Monitoring of hoist and swing drives as shown in AMS Suite: Asset Graphics.
Diagnostic solution for new and existing shovels

An electric rope shovel is purchased with the expectation that it will remain in operation for 30+ years. Including a monitoring system on a newly built shovel is ideal, but the system is even more critical to those workhorses already in the field.

Whether pre-installed on a new shovel or retro-fitted to an existing shovel the CSI 6500 delivers the same diagnostic capabilities with the same proven results.

Emerson co-develops new applications with leading global suppliers so systems are field-proven before reaching end users. The CSI 6500 has monitored shovel operations for hundreds of thousands of hours in the field before becoming a standard shovel offering from the industry’s largest supplier of mobile mining equipment.
Solutions for creating a comprehensive picture of machinery health

Data from the CSI 6500 is sent to Emerson’s AMS Suite: Machinery Health Manager for trending, diagnosing and reporting of the developing faults in the shovel. AMS Machinery Manager integrates data from the online monitoring system alongside other predictive technologies – periodic monitoring, thermographic and oil analysis – to give you a comprehensive picture of the shovel’s machinery health. AMS Suite can integrate data from other production assets for a comprehensive look across the entire site – from pit to processing.

CSI 2140
Emerson’s periodic monitoring solution for your rotating equipment located in the processing facility. Featuring many of the same advanced analysis capabilities such as PeakVue technology, the CSI 2140 delivers advanced testing and analysis capabilities in the field.

CSI 9420
When rotating assets are far from the control room, such as those driving your critical conveyors, the CSI 9420 offers data collection and wireless transmission of that data back to the facility quickly and safely.

AMS Suite integrates data from the various vibration data collection methods into a single database, alongside information from your thermographic and lubrication programs. This comprehensive approach to trending and viewing data along with the ability to focus on assets with developing faults provides the best opportunity for improved reliability of your rotating equipment.

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