Mobile Equipment Monitor Enables a Reduction in Downtime and Increase in Safety

Challenge
A shovel shuts down after a dipper drop at a large coal mine in Wyoming. At stake is the safety of mine employees and the reduction or elimination of costly shovel downtime required to investigate the incident so a quick and reliable diagnosis of the root cause of the dipper drop incident is critical.

Solution
Staff from the mining equipment company analyze data captured by their remote monitoring solution, powered by Mobile Equipment Monitor, to quickly diagnose root cause and determine that the shovel is safe to operate without time consuming travel to site or costly downtime.

Advantage
- Faster, more reliable diagnosis of root cause
- Fast redeployment of shovel
- Confidence in shovel safety
- Able to institute key design changes
- Savings of $1.2 - 3.6 million in downtime costs per incident
- Elimination of onsite visit

Mobile Equipment Monitor is Powered by Matrikon, which represents vendor neutrality. This product works with third-party control systems and applications.

Investigation of a Dipper Drop
In the surface mining industry, a shovel dipper drop—an uncontrolled motion of the dipper due to gravity—is a significant event. In some cases, the shovel’s control system is able to regain control and stop the motion before damage is done. In other cases, the dipper stops when it hits the ground or, in a worst-case scenario, comes into contact with another piece of equipment.

Dipper drops can occur for a variety of reasons, including:
- mechanical failures in the shovel
- electrical and control system disruption
- machine overloads
- operator error

The suspended loads in the dipper can range up to 200 tons for some equipment models. As a result, understanding the root cause of a dipper drop is crucial to ensuring the safety of the employees and the equipment.

Typically when a dipper drop occurs, a significant effort is required to investigate and determine the root cause of the event. Not only must technicians from the equipment company visit the mine, the shovel remains down for the duration of the investigation, which can take anywhere from one to three days to perform. Shovel downtime at current market rates costs the mine approximately $50,000 every hour in lost production.

The investigation requires significant time and effort to recreate and understand the conditions at the time of the dipper drop. Physical inspection of the shovel looks for damage that may be a cause or result of the event. The shovel operator is interviewed in order to understand the events leading up to the dipper drop. Equipment company staff may sit on the shovel and either wait for another incident to occur or try to recreate the original incident. During this time, they connect a laptop to the shovel in an effort to collect the data points that they believe will help them to understand the incident. If their best guess is wrong, the data will be useless. It is often difficult or impossible to fully understand the root cause behind the event.
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**A Better Way to Investigate**

Within 24 hours of its installation on a shovel in a Wyoming coal mine, the remote monitoring solution powered by Mobile Equipment Monitor already proved its worth. The system provided the equipment company’s regional product specialist with a more effective toolset to investigate a dipper drop incident. The technician was asleep at home when the mine called to report that a shovel had shut down after experiencing an uncontrolled dipper drop. With no prior training on the remote monitoring system, he quickly logged on to the central database in Milwaukee from his home computer in Wyoming and was able to see real-time operating data on that specific shovel.

From experience, the technician knew to look at the hoist system. Because the remote monitoring solution was capturing and archiving hundreds of data points from the shovel, he was able to quickly find the fault associated with the shutdown and use the system’s analytical tools to analyse the data leading up to the fault. Within the hour, he was able to diagnose the problem. The data indicated that the shovel event had been induced by operator action rather than a system failure. Equally important, the data indicated that it was safe to restart the shovel.

**Saving Time and Producing Better Results**

The remote monitoring solution saved the mine 24 to 72 hours of shovel downtime—time that would have been spent diagnosing and recreating the original event with often inconclusive results. The system allowed the technician to quickly provide a more reliable diagnosis of the root cause of the dipper drop event without a trip to the mine or extensive downtime. Because of the system’s comprehensive data collection, he was able to investigate the original dipper drop incident itself for a more reliable analysis instead of trying to collect data from a recreated incident. He had immediate, remote access to the actual data from the actual event and was able to quickly and reliably diagnose the root cause.

The technician determined that the fault occurred due to operator error, allowing the mine to address a training issue. Even more importantly, he knew that the shovel was operating properly and recommended that it continue operating, avoiding the significant downtime and production losses usually involved in machine troubleshooting.