HOW SAFE IS YOUR MINE HOIST?

In today's era of ever tightening resources, human and financial, it is becoming ever more challenging to ensure mine hoists perform to the expected standard

By Slobodan Vidmar

Mine hoists are responsible for the safe transport of people and material underground so they need to be 100 per cent reliable. Keeping the hoist up and running requires - more than any other item of mining equipment - the skills of two diverse engineering teams: the electrical, and the mechanical.

Yet the electrical and mechanical engineering skills needed to look after today's mine hoists have changed considerably in the past decade.

Mine hoists are sophisticated machines. They are packed with the latest technology, including process control systems, variable-speed drives, electric motors, controlled braking systems, electrical networks, temperature control, limits of travel, and rope and shaft equipment protection – all of which are programmed and finely tuned to work together, reliably, efficiently and in a way that ensures these multiple levels of protection will prevent serious incidents. Mine hoist systems need to operate at maximum efficiency with optimum capital and maintenance cost.

And that is exactly what hoists strive to do. To date, their track record of safe performance at thousands of mines worldwide has been relatively unblemished.

Changing performance

Over time, however, mine hoists begin to get less efficient. For example, they may slow down or begin to operate irregularly –often using increasingly more energy as compared with initial specifications. Even if a hoist is operating well, it could be masking a problem. Things to watch out for include a change in emergency deceleration rate during emergency stop, mechanical or tread wear compensation, drift in duty cycle due to tread wear, and any abnormal noises or changes in running temperatures, bearings and motor.

Skills shortage

Attributing performance drift to poor maintenance is over-sim-

plifying the issue. A key factor is generally an insufficient understanding of how the mechanical and electrical systems influence each other. Additionally, as on-site maintenance workers become less specialized, dealing with increasingly sophisticated mine hoists becomes more difficult.

Over time, system settings need to be adjusted due to equipment wear, and overall changes in operating conditions, which lead to hoist performance deviating from its optimum set up. To carry out these setting adjustments, an engineer must have a deep knowledge and overall understanding of the mine hoist.

Existing maintenance procedures, however, focus on individual parts of the hoist rather than the construct as whole. Considering that mechanical issues can impact electrical parts (and vice versa), dealing with one problem, without adequately considering the system in its totality, can have unintended consequences in the mine hoist's overall functioning.

Mine operators without specialist on-site hoist maintenance expertise, therefore, need to ensure that outsourcing maintenance goes to the supplier with the best blend of electrical and mechanical skills.

Maintaining standards

The selected supplier must be familiar with local mining authorities' regulations and standards covering performance and safety of mine hoists. Each country has its own individual mining regulations, with others, notably Canada and Australia, having regional authorities that further specify additional requirements. If the hoist owners are not complying with requirements, the local authority has the right to close down the mine operation.

The American approach to mine safety in general, and to mine hoist ropes in particular, differs significantly from that used in Europe. The American regulations are fewer and less detailed, and leave room for the mine operator to exercise their authority.

This regulatory simplicity is facilitated by the overriding laws that make the mine operator fully responsible for the results of their actions. It is the operator who decides what standards apply, who does the inspection/ maintenance work, and how much training is needed. This simplicity in turn lowers the cost of training and enforcement, as well as reduces the bureaucracy.

Safety

The most critical issue is "hidden failures," problems lurking behind the scenes, unobserved, unless a failure occurs or specific tests are conducted to detect their presence.

Considering that hoist systems have heavy payloads travelling at high speeds, any failure is likely to have fatal and/or expensive consequences. Mine hoists, however, are large constructs spread over massive areas and maintenance time windows are limited. As a consequence, some parts are rarely checked, if ever.

Consider end-of-line protection devices, for example; they never work unless needed. If they are not tested regularly, how do you know if they will work correctly? Checking these parts can be a time-consuming and intimidating undertaking as it means means disabling all the fail-safe devices that go before within the system.

For instance, a jack catcher is a device that prevents a hoist from falling into a shaft if there is an incident. It is the last line of defense, but it is rarely called into action because of all the earlier fail-safe devices. However, because it rarely operates, it hardly ever gets maintained. During one inspection severe corrosion was spotted on the jack catcher. The plant supervisor was surprised as no one had ever inspected this component. The result is that, after 15 years, all jack catchers were fully replaced.

It is critical these life- and equipment-saving devices work. If you don't test them, however, you don't know whether you are, in fact, protected.

Performance

Sub-standard performance is often man-made. When troubleshooting, for example, a hoist's production cyle is reduced until the issue has been resolved. It is not uncommon for maintenance crews to forget to return the duty cycle to its normal level following the repair –particularly if it took several shifts to fix the problem. Hundreds of thousands of dollars can easily be lost before this oversight is corrected.

Reliability

Common causes of unscheduled repairs include a build-up of dust and dirt under the switches and in the latch arms on the skips. Changes and over-wind trips on the friction hoist's manufacturing cycle are often the result of excessive friction insert wear.

Unplanned breakdowns can cost up to seven times more than planned repairs so regular maintenance is essential to maintain optimum performance cost effectively.

ABB, the leading power and automation technology group, has launched a relatively new service product called Hoist Performance Fingerprint (HPFP) to help mine operators assess and optimize the condition of their mine hoists –whether they use ABB equipment or not. This auditing service simultaneously covers all electrical and mechanical parts.

With assessment and testing of the entire system, ABB can recommend actions that are prioritized with respect to urgency, budgetary constraints, and status of the equipment lifecycle.This information will also help close hoist performance gaps with respect to compliance against local statutory requirements, hidden failures, shortfalls in preventive maintenance, and maintenance training.

Launched first in Australia, a majority of hoist sites there have subscribed to the HPFP service; some have even signed up for quarterly inspections. Its appeal lies in the fact the service enables hoist operators to reduce operational costs, while simultaneously increasing production and business sustainability. EM&R

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