A chilly start

Looking at best practices for increasing engine reliability in cold temperatures

Mining companies are always looking for ways to lower their costs of operation. Reducing downtime of equipment and the cost per tonne mined can have a significant impact on the overall profitability of an operation, so positively influencing those variables can make a notable impact on the bottom-line. In areas that experience harsh weather conditions, the challenge becomes even greater, but so do the opportunities.

Downtime is one of the most expensive factors in the overall cost equation for mining operations. While planned downtime proves to be costly, unplanned downtime due to equipment issues impacted by operating in harsh environments has an even greater negative effect on efficiency and productivity. With many mining operations running 24-hours a day, the stress on equipment takes a costly toll. Yet concurrently, there is an increased need for longer machine life to improve return on investment and decrease the need for machine re-powers.

While increasing equipment life is one part of the equation, increasing the operating efficiency of the equipment is another variable that must be considered. Energy consumption related to material haulage is a major contributor of total energy expenditures and represents one of the most critical factors that can be optimised. Some estimates have found that the fuel used for on-site haulage can exceed 50% of a mine's total energy costs, so a variance in any direction can have a substantial impact on reducing or increasing the cost per tonne.

These costs are also impacted by environmental conditions such as harsh weather conditions, specifically extreme cold temperatures that can create many challenges including fuel dilution, overcooling, and difficulty for diesel particulate filters (DPFs) to regenerate.

One proven way to increase machine life, increase fuel savings, and improve efficiency in extreme temperatures is to utilise a variable speed fan drive.

Variable speed fan drives provide precise engine cooling versus the standard operating model of direct drives, which are always engaged regardless of other varying factors such as temperature. By running the cooling fan at a constant speed in cold weather conditions, it results in overcooling of the engine, a condition where the engine and associated subsystems are unable to achieve sufficient temperature for proper combustion and optimal engine performance.

A variable speed fan drive adjusts to conditions, which eliminates over cooling and enables optimal equipment performance and efficiencies. By reducing fan load and speed, less power is drawn away from the equipment, parasitics are minimised, and the result is more available horsepower which can be used for doing more work.

The reduction in fan speed enabled by a variable speed fan drive also contributes to improvements in engine belt life and decreases in radiator clogging. Hydraulic fluids also maintain more consistent flow and are able to reach optimal operating temperatures faster.

In addition to better cold weather operation, increased fuel efficiency, and more available horsepower, variable speed fan drives also reduce fan noise and make communications easier, which can play an important role in increasing safety in a mining environment during harsh weather conditions. Operator comfort can also be a variable when considering overall performance.

Another best practice related to cold weather equipment operation is the use of the synthetic engine and hydraulic oil. The use of such lubrication materials functions better in withstanding extreme temperatures and maintain better flow in low temperatures versus non-synthetics. Conversely, they also provide better protection in high temperatures by resisting viscosity changes, while conventional oil can break down or evaporate molecules, reducing the protection of the oil for the engine. Synthetics can also provide for longer service intervals, which results in a number of benefits for operators including less downtime, and less waste.

By utilising fuel-saving components such as variable speed fan drives, engine life is increased

While mining operations want optimal, consistent performance throughout the year, maintaining costly equipment that has a significant impact on overall efficiencies and return on investment can be challenging during cold, harsh weather conditions.

By utilising fuel-saving components such as variable speed fan drives, engine life is increased, scheduled maintenance and unplanned downtime can be decreased while improving operator benefits such as better communication and less fatigue through noise reduction.

In addition to variable speed fan drives, using the synthetic engine and hydraulic oil can add to overall operating efficiencies and cost savings when operating in cold weather.

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