

Insight study: How to improve the OEE of mining conveyors

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Profitability, productivity, worker health and safety, and environmental compliance are challenges that are well known in the industry. But some of the most significant and easily implemented improvements are still far from commonplace.

Overall Equipment Effectiveness

According to a poll taken at the SKF Life Cycle Management for Mining and Cement Conference 2018, the most important key performance indicators in the mining, mineral processing and cement industries are availability and Overall Equipment Effectiveness (OEE). In 4 out of 10 mining plants, availability is less than 80%. Only a few plants reach 92% or more.

- 1 Availability
- 2 Overall Equipment Effectiveness (OEE)
- 3 Tons per hour
- 4 Cost per ton
- 5 Mean Time Between Failure (MTBF)

Top key performance indicators ranked in order of importance.

OEE = Availability x Performance x Quality
Standard definition of Overall Equipment Effectiveness

Mining produces a quasi-uniform flow of bulk product. Availability measures the proportion of total time that the equipment is available for production. Performance measures the production rate, and Quality measures product quality, for instance the grade of the ore. The traditional view of production maintains that achieving high equipment availability is a maintenance responsibility, while achieving maximum performance is the responsibility of operations.

However, machinery reliability influences both availability and performance. Consider the situation where a conveyor is operating, but due to certain problems, it can only move at 80% of its normal capacity. The conveyor is available and utilized, but clearly maximum output is not being achieved. Similarly, frequent stops, planned or unplanned, cause connected process machinery to be temporarily idle. Machinery reliability is thus of paramount importance for the OEE in mining.

The bottleneck in improving mining OEE

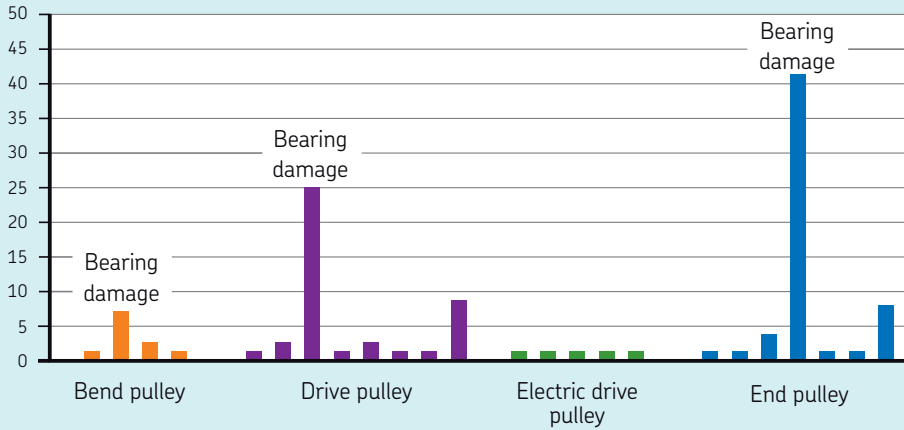
Another customer poll at the SKF Life Cycle Management Conference 2018 revealed that conveyors are the most problematic asset type in terms of reliability.

- 44% Conveyors
- 17% Mobile equipment
- 11% Grinding mills
- 11% Crushers
- 6% HPGR/Roller presses
- 6% Fans
- 6% Pumps
- 0% Vibrating screens

The most problematic assets of the mining, mineral processing and cement industries.

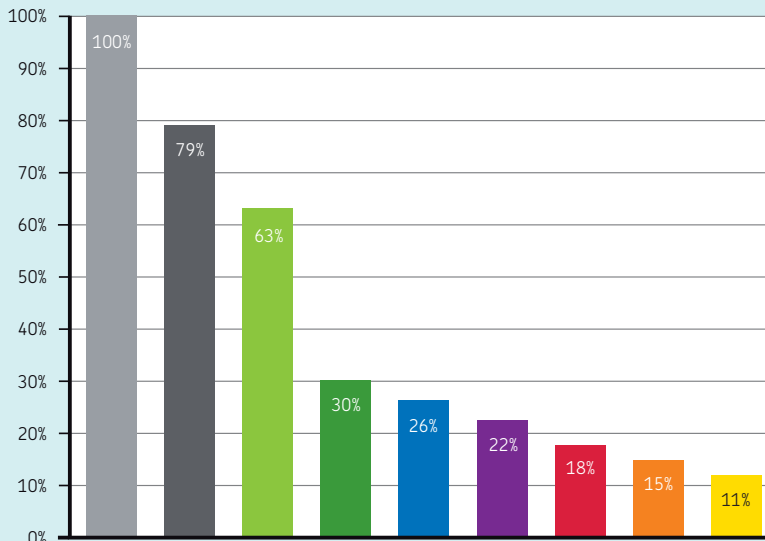
An in-depth analysis of 2-year predictive maintenance records of a conveyor system at an iron ore mine in Northern Europe revealed that bearing damage in the end pulley and drive pulley are the two chief causes of conveyor breakdowns.

Conveyor damage



In addition, an audit including visual inspection of 11 conveyors at a major iron ore mine in Australia including 39 pulleys with 78 bearing housings in total revealed that contamination and improper lubrication are the main issues in pulley bearing breakdowns.

Identified problems




- Contaminated lubrication grease point
- Highly contaminated surroundings
- Lubrication point in wrong location mounted on housing
- Lubrication point hard to access
- Little or no evidence of lubricant at grease exit point of sealing arrangement
- Too many lubrication points mounted on bearing housing
- Grease leakage from end cover of housing
- Inappropriate sealing arrangement
- Lubrication lines too long

Health and safety issues

Data from the Mine Safety and Health Administration (MSHA), an agency of the U.S. Department of Labor, showed that 43% of injuries and 24% of fatal accidents in mining occur during conveyor maintenance or inspection. The conveyor-related fatal accidents typically include replacing idlers, clearing blockages and cleaning up with a shovel or hose.

Optimal conveyor maintenance

There is a constant battle between managing maintenance costs and machine ROI targets. This is particularly true for conveyor systems.


43%
 of injuries
 occur in conveyor
 maintenance

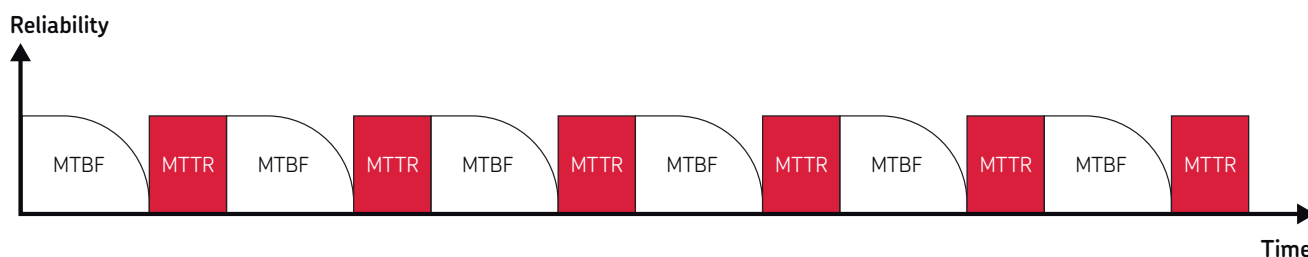

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OOE conveyor improvement program

SKF recommends a 3-step approach to increase the reliability and availability of mining conveyors:

- 1 Upgrade the conveyor pulley bearings to match or exceed the service life of the conveyor lagging using the SKF Three-barrier solution. This is to increase pulley reliability, reduce grease consumption (as much as 90%) and improve worker safety.
- 2 Install single point or multi-point automated lubricators or systems to better control grease consumption and reduce the exposure of workers to the rotating machinery and hazardous areas. This will improve worker safety and reduce grease consumption and waste.
- 3 Include vibration and temperature monitoring of the conveyor pulley bearings and drives as part of a comprehensive predictive maintenance programme. The monitoring can be periodic or continuous. This is to help avoid unplanned downtime and reduce the extent of repairs when needed, thereby improving worker safety.

Conventional conveyor pulley bearing



Conveyor pulley with SKF Three-barrier solution

