Reliable operation at dolomite quarry – Improved bearing protection by NUFLUX® technology

CASE STUDY: DOLOMITE QUARRY / AFRICA

Continuous, uninterrupted operation of key equipment is essential for the overall productivity of any mining site. To demonstrate the impact of the industrial gear oil on the equipment, a trial was conducted at a dolomite quarry in Africa. **NUFLUX®** technology was tested vs. conventional mineral gear oil, both working back-to-back in the same gearbox of a conveyor belt system in the mine. **NUFLUX®** is a well-established technology from Evonik, utilizing **VISCOBASE®** synthetic base fluids in combination with highly refined or synthetic hydrocarbon base oils, enabling cost-effective, high-performance industrial gear oils. **NUFLUX®** formulations meet all requirements of challenging national standards and hold multiple OEM approvals.

EQUIPMENT AND TEST PROCEDURE

The trial utilized a Hansen RDE33Q gearbox installed on a lengthy conveyor system which transferred dolomite from the mine to a processing unit which was 1.8 km away and 300 meters up. The surrounding environment was dusty, and the gearbox experienced irregular loads. The gearbox was filled with 35L of ISO VG 320 gear oil. In this test, Evonik's **NUFLUX® ISO VG 320** gear oil was compared against an OEM approved mineral based lubricant of the same viscosity. This comparison was completed over six months using an alternating A-B-A design with each phase lasting two months. To ensure integrity of the experiment, gearbox and ambient temperatures were monitored throughout the whole experiment, confirming that there was no impact from ambient temperature fluctuations. A key tool in the six-month study was shock pulse monitoring which was used to monitor bearing defect frequencies and diagnose the effect of the different gear oils on bearing operation.

Fig. 1. Conveyor belt to pit

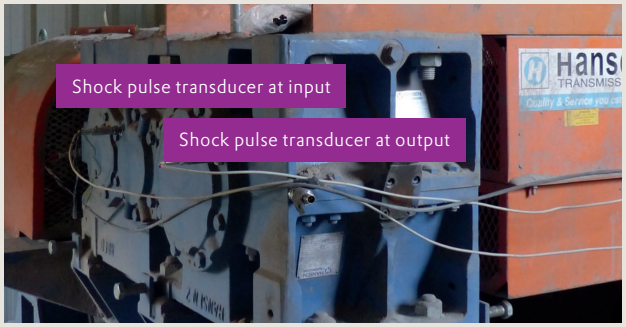

Fig. 2. Sensors installed on gearbox

ANALYTICAL SYSTEM

The SPM HD® system uses shock pulse transducers, which convert shock pulses emitted by the bearing into electric signals proportional to the shock magnitude. The shock pulse amplitude correlates to three basic factors which are rolling velocity, oil film thickness, and mechanical state of the bearing surfaces. The output signal HDc is a scalar value expressed in decibels and is used to determine the lubrication condition. Lower HDc amplitudes indicate better lubricant film thickness and improved lubrication at the contact between the loaded rolling element and the raceway in a bearing.

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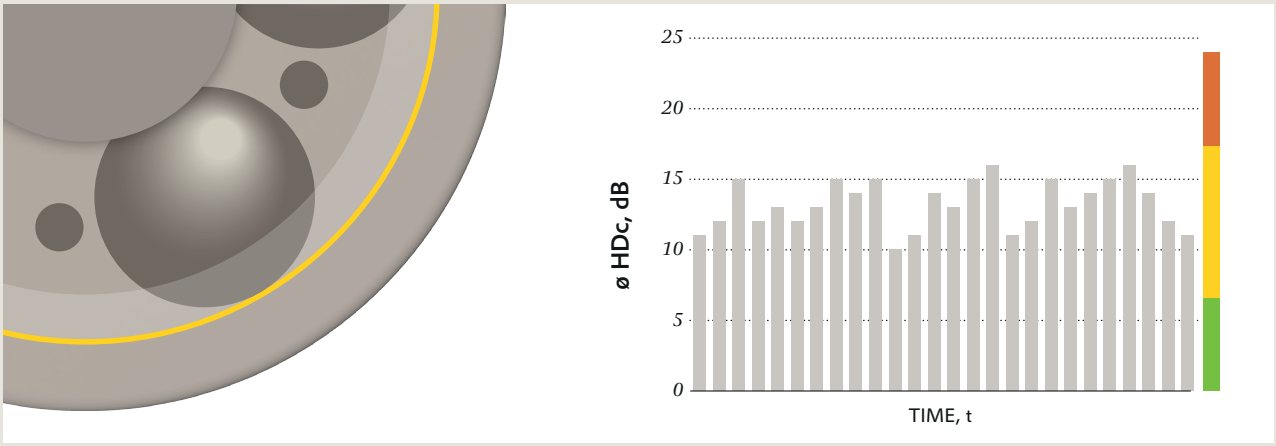

Fig. 3. Schematic explanation of HDc signal and fluid film thickness

TEST RESULTS

The results of shock pulse monitoring are shown in Figure 4. Each bar represents the average from two months of testing. The results for the mineral based ISO VG 320 at the beginning and the end of the trial are in good agreement with each other. The lowest HDc levels were observed while operating with **NUFLUX® ISO VG 320**, at both the input and output shaft. These lower HDc values mean that significantly better lubrication at contact points was achieved. The higher HDc signal of mineral gear oil indicates inferior fluid film thickness, as depicted in Figure 5.

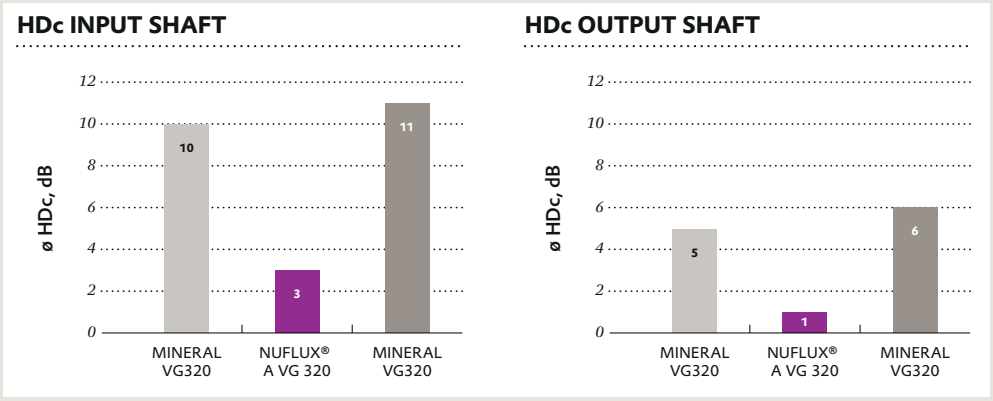

Fig. 4. Difference in HDc level of input and output shaft by function of different lubricant types

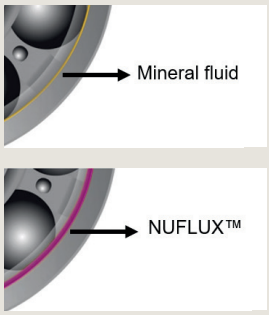

Fig. 5. Graphic images of fluid film thicknesses of tested gear oils

CONCLUSION

NUFLUX® technology offers superior bearing lubrication when compared against a conventional gear oil. Better lubrication means reduced friction, extended drain intervals and longer equipment lifetime. For a mine, such as this dolomite quarry, these advantages translate into productivity gains and lower maintenance costs.

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