

Different gear failure modes are strongly correlated with lubricant status, for example low oil level or starved lubrication leads to significant gear damages. In order to develop an early detection and accurate diagnosis of gearbox lubricant serving conditions based on online vibration measurements, this study will investigate the effect of lubricant starvation on the gearbox vibration responses. A two-stage helical industrial gearbox was tested under different lubricant shortage conditions. Any shortages in the oil service volume reduce the consumption power of the driving motor due to the decreasing of dipping oil churning losses and the submerge depth of gears. However, breakdown in the oil film and increasing in the sliding friction between the contact tooth surfaces are more expected, which affect the vibration characteristics of the gear system. The test was carried out with normal oil quantity and two lubricant shortages under different operating conditions. The results show that the gearbox vibration signature changes significantly with lubricant starvation, which includes more consistent increase in the amplitudes of vibration responses at meshing frequency harmonics and their associated sideband components. These changes correspond that vibration signal can be considered to normalise condition indicator of gearbox lubricant starvations.