CHAPTER 9

CONDITION MONITORING STUDY ON BALL BEARING
CONSIDERING SOLID CONTAMINANTS IN LUBRICANT

9.1 INTRODUCTION

In rolling element bearing, contamination of lubricant grease by solid particles is one among the several reasons for early bearing failure. This chapter deals with the effects of lubricant contamination by solid particles on the behavior of rolling bearing. In this context, the present study investigates the effect of lubricant by solid particles on the dynamic behavior of rolling element bearings. Silica powder in three concentration levels and different particle size are used as contaminant in the lubricant. The contaminant concentrations as well as the particle size are varied. Vibration signatures are obtained in terms of Root Mean Square (RMS) values. The effects of contaminant and the bearing vibration are studied for good and defective bearings.

9.2 METHODOLOGY

Grease lubricated ball bearing is used for conducting experiments. Silica particles of different concentrations are used as solid contaminants. Silica particles of 90 µm (T1), 150 µm (T2) and 300 µm (T3) size are used as grease contaminants as shown in Figure 9.1. The size of the particles are obtained through screens of 600 and 300, 150 and 90 meshes. SKF-LGWA2 type of grease is used in these tests. The SKF-LGWA2 grease contains
9.4.3 Effect of Particle Size on Vibration Levels of Good and Defective Bearings

The maximum vibration amplitudes obtained for various cases are listed in Table 9.7. The effect of particle size of contaminants on maximum vibration level is shown in Figure 9.19. In case of good bearing, the increase in particle size does not produce any visible changes in the maximum vibration amplitude levels. For a defective bearing, when the particle size is increased from 90 µm to 150 µm, the vibration level increases. Further increase in particle size to 300µm, the drop in maximum vibration amplitude is observed. Similar aspects are observed at 740, 1150 and 1600 rpm, except that the magnitude values are different. With the increase of speed, amplitude level increases.

9.5 CONCLUDING REMARKS

In the present work, ball bearings are tested in order to study the effect of solid contaminants present in grease lubrication. The tests are conducted for defect-free and defective bearing by considering silica particle as contaminants. The results shows the significant variation in the rms velocity at different speed, concentration and particle size. The effect of contaminant concentration on vibration is distinct from that of the particle size. The vibration level increases with concentration level, leading to stability. When the particle size is small the vibration level increases and decreases as the particle size increases. The decrease in vibration amplitude is due to more internal resistance of the bearing. Surface damage is observed in the frequency spectrum as a side band near the defect frequency.