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Ball bearing performance analysis with vibration analysis using different types of oil lubricants

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Abstract

Roller bearings are the most important parts of the rotor shaft system. Failure to do so may result in serious consequences. To reduce the chance of running, the researchers studied the characteristic and short-lived characteristics of the body's mixing and vibration analysis. Various procedures have been performed and complete records are available for different conditions. In this study, several carrier rotor structures have different load and failure conditions are shortened. And again, different approaches and techniques have increased the speculation of initial failures. The products in the industry are of great value, leading to biological products. A test and signature analysis with the MATLAB software was performed to evaluate the vibration data of the ball bags to find the perfect lubricating oil used as 50N. An in-depth analysis using the FFT method is performed to detect the vibration response.

Keywords: ball bearing, vibration analysis, time series signal, fast foriour transformation, oil lubricants.

Introduction

Rotating objects have special properties and include rotating mechanisms. Rotating ball bearings have been widely used in various industrial technologies. As there is a wide range of applications to the rotor-carrying system, it becomes a high level of importance for the study of low-frequency rotator systems. It is aimed at heavy load writing, which carries light in deformed areas such as spalls, brinelling, dents, holes, and cracks. This makes the cycle of relationship exhaustion of life and the vibration of this great producer of the stud space. The term ‘vibration’ is commonly studied under the context of quality control to assess life, reliability, design, and safety. The carrier quality control can produce better performance and the quality of the ball carrier. The good design of the diagnostic method is used in the analytical analysis, the current vehicle inspection, the temperature control, the vibration and so on, for the purpose of understanding the serious error, the vibration monitoring is used to assess the condition of the bearings. Vibration testing of a rotating object carrying a ball is the function of their frequency disturbance.

Experimental test rig

Ball bearing (6203ZZ), solid shaft, coupling, single phase induction motor with variable speed motor to the shaft-rotor assembly and metal corner used to build the test setup. The shaft is supported on a stand-alone ball bearing bearings (6203ZZ) loaded with 50N in a low applied load in loading mechanism. In these experiments, the three types of lubricants such as ISO32, ISO46 and ISO68 were used in the experiment to obtain the signal analysis. A digital tachometer for speed measurement for moving solid shaft was used. Digital temperature meter was used to measure temperature. Digital vibration meter (VB 8205) and data cable were used to measure the digitally vibration data such as velocity (m/s), speed (m/s^2) and frequency (Hz).

Figure 1. Data collecting using vibration meter in experimental setup

Results and Discussion

It is found that the time series signal of velocity (mm/sec) was minimum (amplitude of -86.32 at 0.1942) and maximum (amplitude of 86.35 at 0.8058), fast fourier transformation (FFT) of velocity (mm/sec) was minimum (amplitude of 0.2128 at frequencies of 343.4) and maximum (amplitude of 16.07 at frequencies of 261.07), using oil lubricant of ISO 32, which are shown in Figures 13-14. It is found that the time series signal of velocity (mm/sec) was minimum (amplitude of -59.48 at 0.03) and maximum (amplitude of 57.83 at 0.0008333), fast fourier transformation (FFT) of velocity (mm/sec) was minimum (amplitude of 0.183 at frequencies of 335.2) and maximum (amplitude of 11.51 at frequencies of 353.9), using oil lubricant of ISO 46, which are shown in Figures 15-16. It is found that the time series signal of velocity (mm/sec) was minimum (amplitude of -109.2 at 0.66) and maximum (amplitude of 109.2 at 0.34), fast fourier transformation (FFT) of velocity (mm/sec) was minimum (amplitude of 0.06278 at frequencies of 376) and maximum (amplitude of 30.03 at frequencies of 353.5), using oil lubricant of ISO 68, which are shown in Figures 17-18.

It is found that the time series signal of acceleration (m/sec^2) was minimum (amplitude of -71.7 at 0.57) and maximum (amplitude of 71.7 at 0.43), fast fourier transformation (FFT) of acceleration (m/sec^2) was minimum (amplitude of 0.3394 at frequencies of 344.5) and maximum (amplitude of 12.73 at frequencies of 398.4), using oil lubricant of ISO 32, which are shown in Figures 19-20. It is found that the time series signal of acceleration (m/sec^2) was minimum (amplitude of -79.59 at 0.3008) and maximum (amplitude of 79.59 at 0.6992), fast fourier transformation (FFT) of acceleration (m/sec^2) was minimum (amplitude of 0.1164 at frequencies of 308.2) and maximum (amplitude of 11.9 at frequencies of 284.8), using oil lubricant of ISO 46, which are shown in Figures 21-22. It is found that the time series signal of acceleration (m/sec^2) was minimum (amplitude of -59.43 at 0.7) and maximum (amplitude of 59.43 at 0.3), fast fourier transformation (FFT) of acceleration (m/sec^2) was minimum (amplitude of 0.12234 at frequencies of 339.8) and maximum (amplitude of 13.93 at frequencies of 257.8), using oil lubricant of ISO 68, which are shown in Figures 23-24.

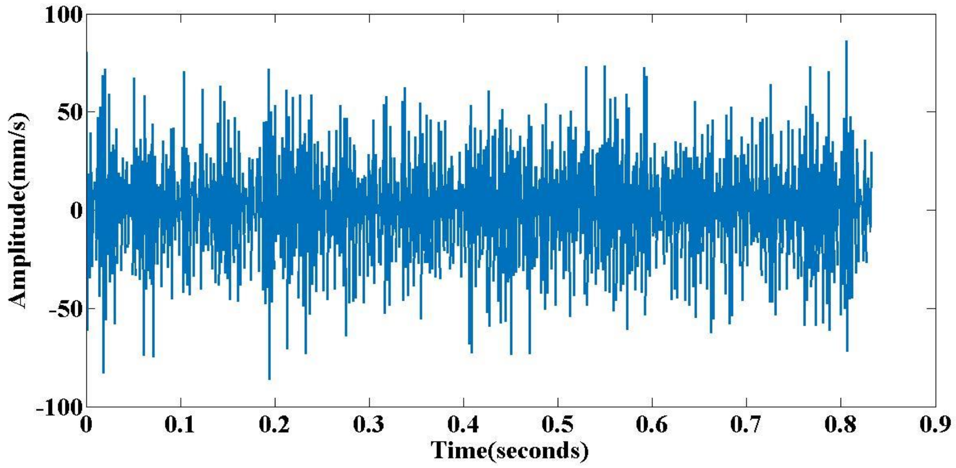

Figure 2. Time series signal of velocity using oil lubricant of ISO 32

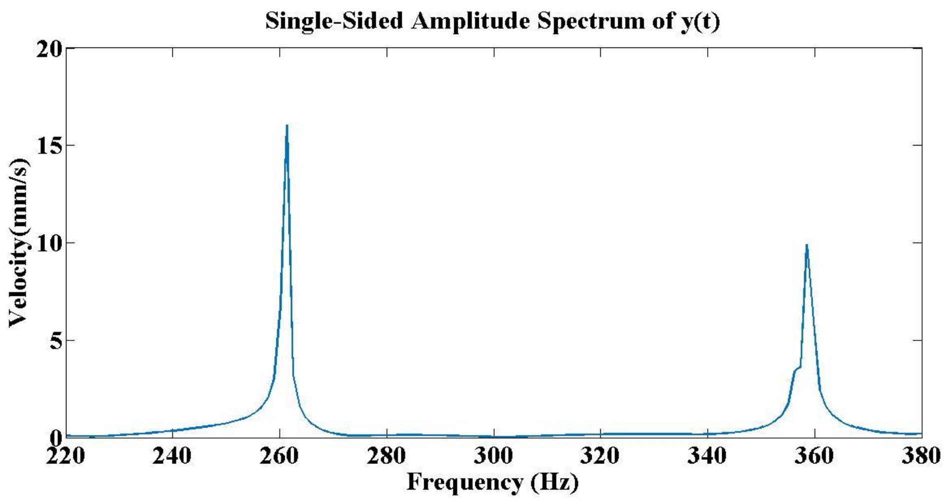

Figure 3. Fast fourier transformation (FFT) of velocity using oil lubricant of ISO 32

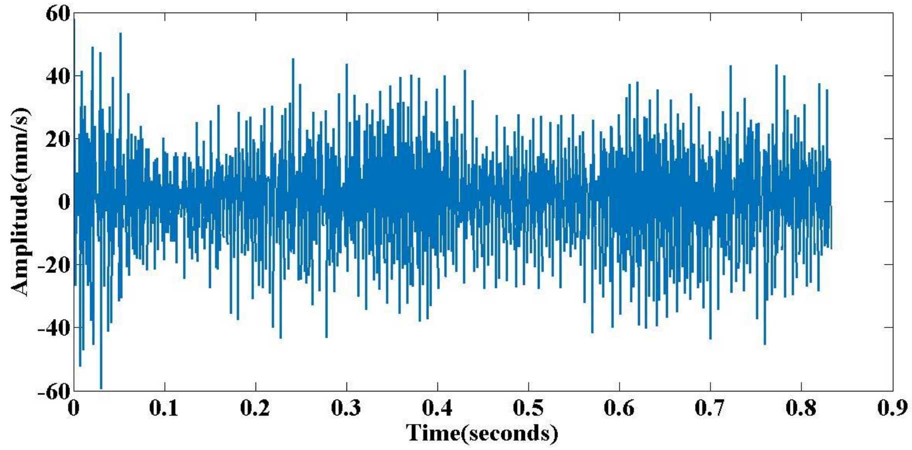

Figure 4. Time series signal of velocity using oil lubricant of ISO 46

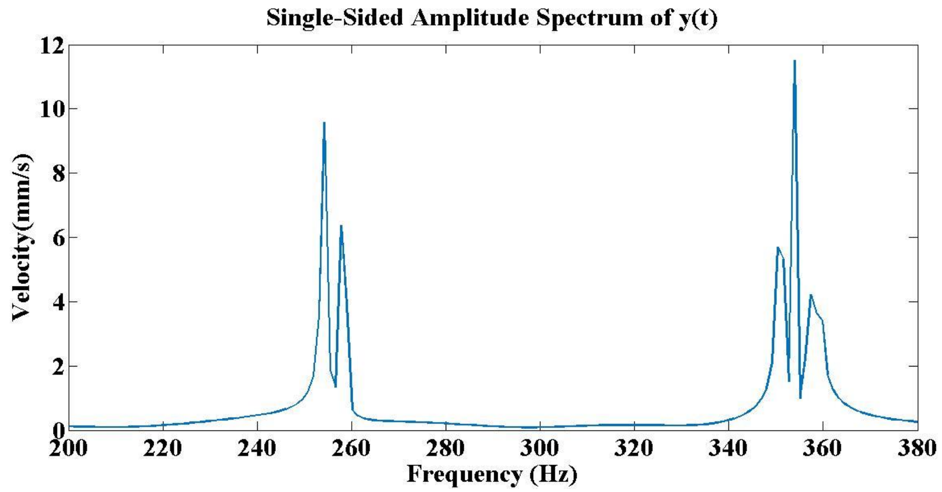

Figure 5. Fast fourier transformation (FFT) of velocity using oil lubricant of ISO 46

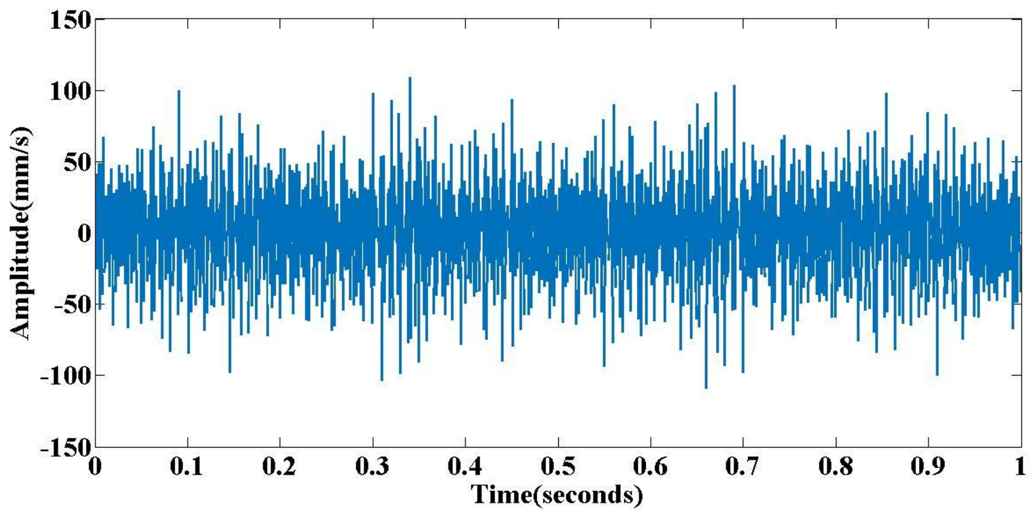

Figure 6. Time series signal of velocity using oil lubricant of ISO 68

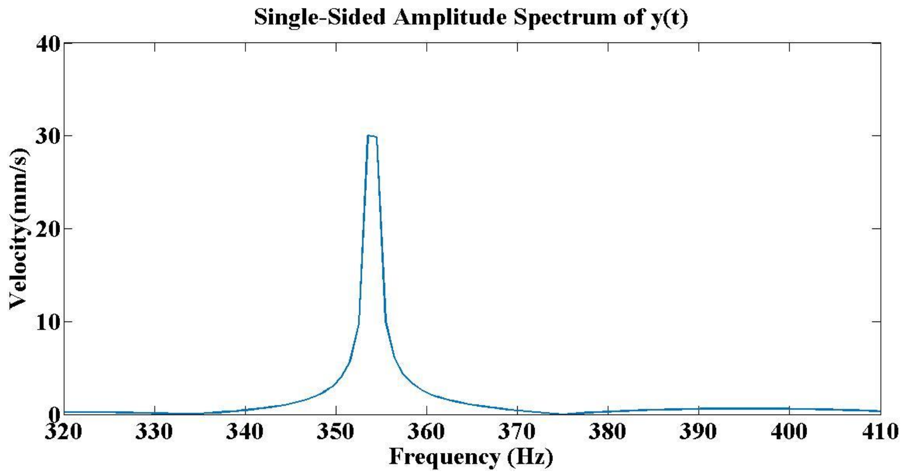

Figure 7. Fast fourier transformation (FFT) of velocity using oil lubricant of ISO 68

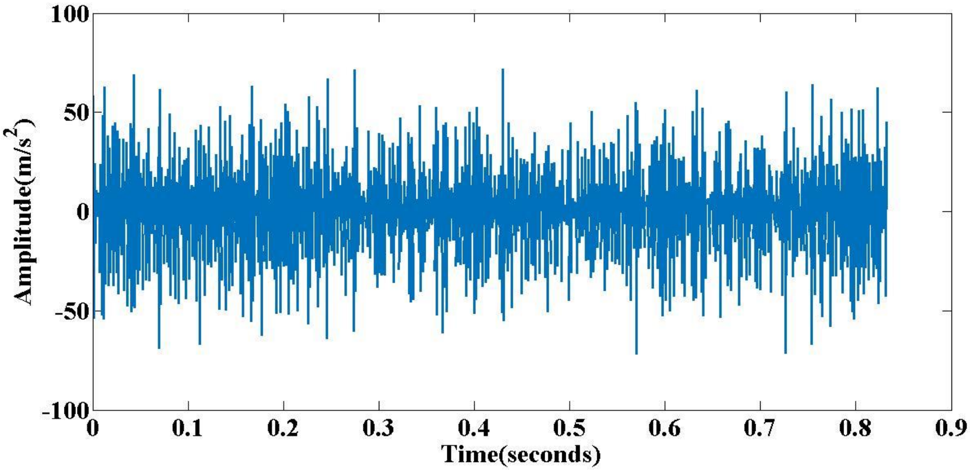

Figure 8. Time series signal of acceleration using oil lubricant of ISO 32

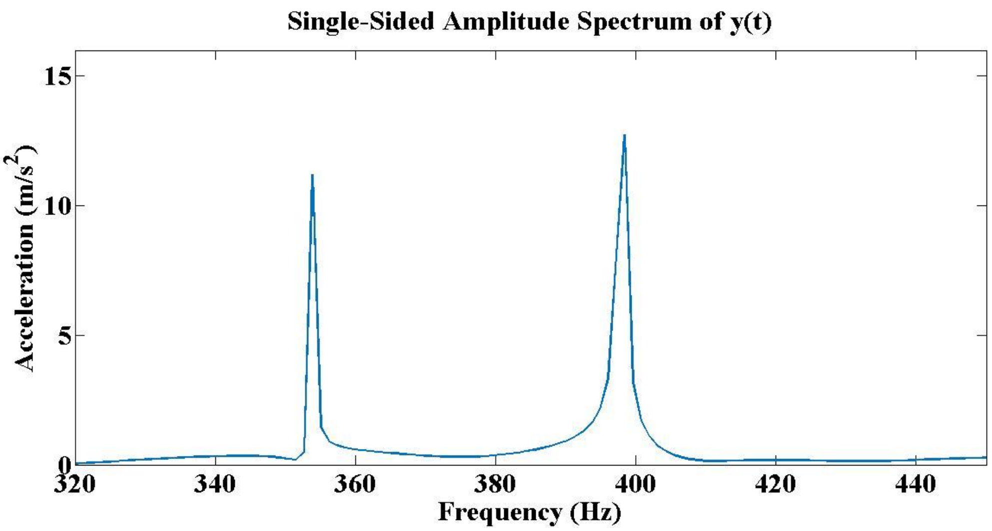

Figure 9. Fast fourier transformation (FFT) of acceleration using oil lubricant of ISO 32

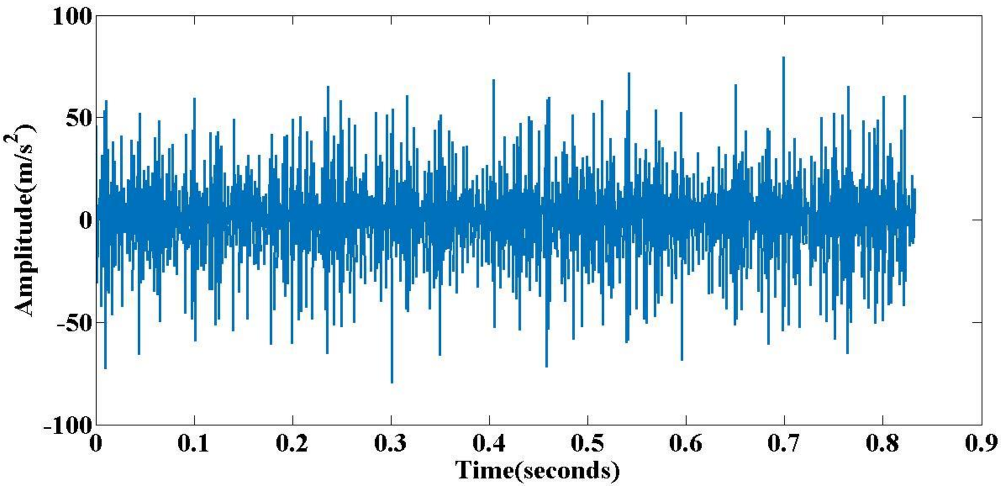

Figure 10. Time series signal of acceleration using oil lubricant of ISO 46

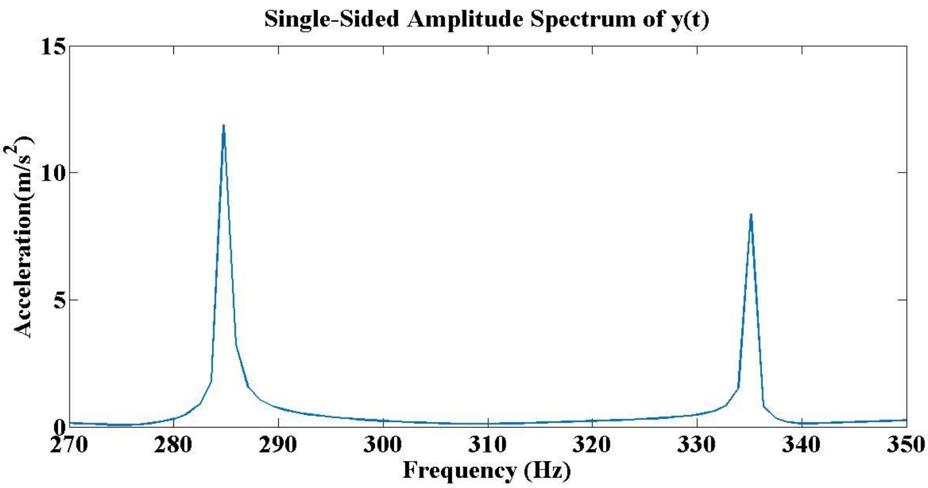

Figure 11. Fast fourier transformation (FFT) of acceleration using oil lubricant of ISO 46

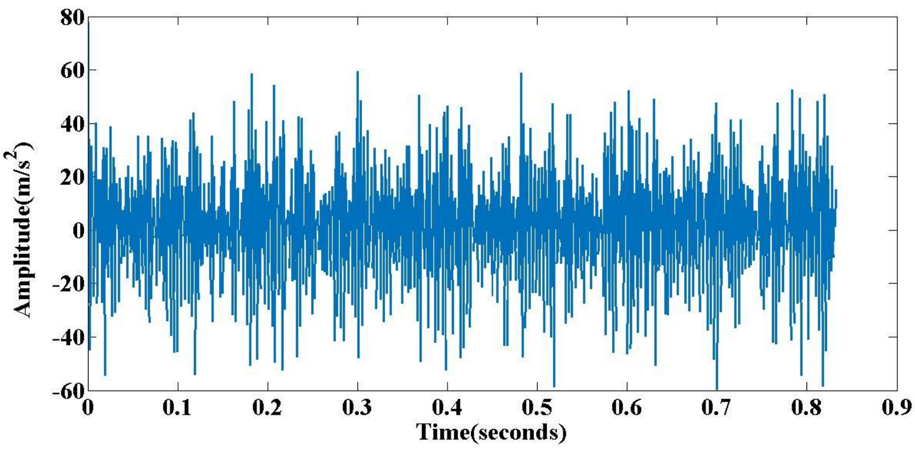

Figure 12. Time series signal of acceleration using oil lubricant of ISO 68

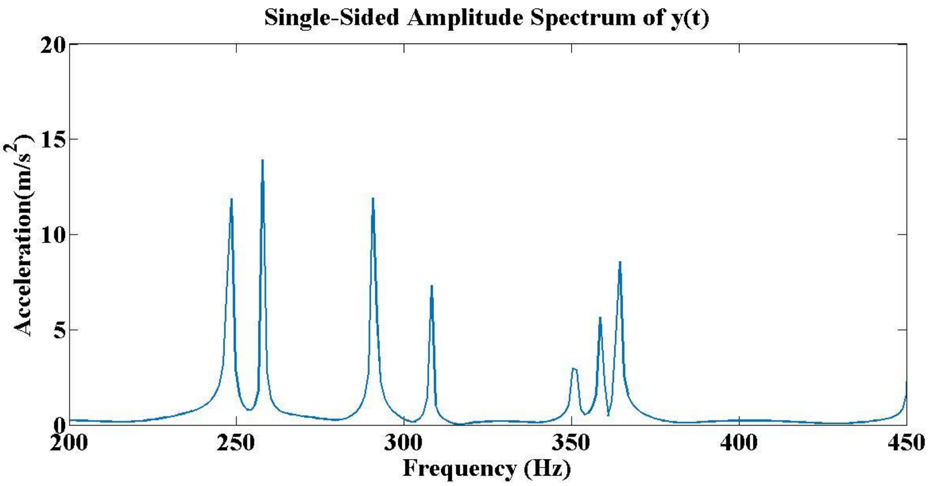

Figure 13. Fast fourier transformation (FFT) of acceleration using oil lubricant of ISO 68

Conclusions

In this study, the final vibration solution was obtained using oil lubricant of ISO 46 compared to other ISO 32 oil and ISO 68, IO 46 lubricating oil was used to reduce the chance of failure and could extend the life of the ball carrier. (6203ZZ). in this study, the signal analysis technique was used as a time signal and Fast fourier transformation (FFT). It is found that by the FFT analysis velocity (mm/sec) was magnitude of 11.51 at frequencies of 353.9), using the ISO 46 lubricating oil, which is shown in Figure 5. It is found that the fourth fast change (FFT) the acceleration (m/sec^2) was very high (a magnitude of 11.9 at frequencies of 284.8), using the ISO 46 lubricating oil, which is shown in Figure 11.

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