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Fault Diagnosis of Gear Box by Using Motor Current Signature

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***Abstract*— There are several method for the monitoring but one is motor current signature analysis. Motor current signature analysis has been used for several years as a diagnostic tool for electrical problems in ac induction motors**

Motor Current Signature Analysis is based on current monitoring of DC motor therefore it is not very expensive. The MCSA uses the current spectrum of the motor for locating characteristic fault frequencies. When a fault is present, the frequency spectrum of the line current becomes different from healthy machine. The various advanced signal processing techniques such as Fast Fourier Transform, Short Time Fourier Transform, Gabor Transform, and Wavelet Transform are available. In present project Fast Fourier Transform method is used for analyzing signals.

***Index Terms*— monitoring, current monitoring of DC motor, signal processing techniques.**

I. INTRODUCTION

This chapter outlines some of the recent reports published in literature on different methods of fault analysis of a faulty gearbox. Gear box fault detection can mainly be done through vibration and motor current analysis. The former method uses the fact that Vibration Faults, when they begin to occur, alter the frequency spectrum of the gear vibration. Particular faults are identified by recognizing the growth of distinctive sideband patterns in the spectrum. The spectrum is recorded with the help of oscilloscope when the accelerometer is placed on the gearbox to be tested.

II. 1ST STAGE

In this present work, it is proposed to design, fabricate and fault diagnosis of single stage spur gear box by using motor current signature analysis. Techniques such as wear and debris analysis, vibration monitoring and acoustic emissions require accessibility to the gearbox either to collect samples or to mount the transducers on or near the gearbox. But dusty environment, background noise, structural vibration etc. may hamper the quality and efficiency of these techniques. Hence, there is a need to monitor the gearbox away from its actual location, which can be achieved through Motor current signature analysis (MCSA)

III. GEARBOX FAULTS

The following faults are very common in gearbox while operating in industries. In some applications such as aircrafts, the reliability of gears may be critical in safeguarding human lives. For this reason, the detection of load faults (especially related to gears) has been an important research area in mechanical engineering for some time. Motors are often coupled to mechanical loads and gears. Several faults can occur in this mechanical arrangement. Examples of such faults are coupling misalignments and faulty gear systems that couple a load to the motor.

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IV. MOTOR CURRENT SIGNATURE ANALYSIS

A common approach for monitoring mechanical failures is vibration monitoring. Due to the nature of mechanical faults, their effect is most straightforward on the vibrations of the affected component. Since vibrations lead to acoustic noise, noise monitoring is also a possible approach. Their use only makes sense in case of large machines or highly critical applications. A cost effective alternative is stator current based monitoring since a current measurement is easy to implement. Moreover, current measurements are already available in many drives for control or protection purposes. However, the effects of mechanical failures on the motor stator current are complex to analyze. Therefore, stator current based monitoring is undoubtedly more difficult than vibration monitoring. This signifies that the motor can be considered as a type of intermediate transducer where various fault effects converge together. This strongly limits the number of necessary sensors. A literature survey showed a lack of analytical models that account for the mechanical fault effect on the stator current. The most widely used method for stator current processing in this context is spectrum estimation. In general, the stator current power spectral density is estimated using Fourier transform based techniques such as the periodogram. These methods require stationary signals i.e. they are inappropriate when frequencies vary with respect to time such as during speed transients. Advanced methods for non-stationary signal analysis are required

A. Accelerometers

Accelerometers are commonly used sensors in fault diagnosis . They are attached to a structure and measure the acceleration of the attachment point. Acceleration is a suitable quantity to measure when high frequency vibrations are of interest. This is often the case in condition monitoring. Accelerometers are used to collect vibration data in the appended papers. Vibrations produced at the gear mesh are transferred to the accelerometer via shafts, bearings and the gearbox housing. Each transfer path has its own transfer function by which the vibrations are colored. Accelerometers can take measurements relatively close to the vibration source. Despite of the transfer path effects, the signals contain less background noise than e.g. microphone signals. To monitor a large machine, it may be necessary to use several accelerometers. Accelerometers must be properly mounted. They can be mounted by screws, magnets, glue Thus, the mounting must be quick and reliable.

Details of further improvement and defferent type of failure and procedure used in motor current signature analysis is described in next paper .

V. CONCLUSION

Vibration monitoring is much more important part of the analysis of any system so that is the effect is much more significant and straightforward . However, the effects of mechanical failures on the motor stator current are complex to analyze.

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