Practical Investigation on Bearing Fault Diagnosis Using Massive Vibration Data and Artificial Neural Network

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Abstract. Bearing faults are one of the most probable causes for machine vibration. Early detections on bearing faults can save invaluable time and cost. In practice, vibration analysis is one of the techniques of condition-based maintenance that allows early detection and reliable diagnosis of bearing faults. In this paper, a test rig is implemented to bring a reliable approach for monitoring and diagnosis. A full spectrum analysis, derived from the fast Fourier transformation, is presented for the vibration signal to reveal combined fault signature of bearing. However, a monitoring system based on an artificial neural network (ANN) model is used to diagnose combined faults in bearings. To train and test the ANN, coded faults are used as output data. To determine the best ANN, a learning algorithm has been chosen and maintained. The proposed method gives more reliable diagnosis in complex faults scenario. Also, the best model can be used by practitioners in the industry as a decision support tool to increase the availability of the machine.

Keywords: Combined faults · Bearing · Vibration analysis · ANN

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1 Introduction

The dynamic forces to which the bearings will be subjected reduce their lifetime considerably. For this reason it is important to correct problems such as misalignments and unbalance, which lead to a very important increase in dynamic efforts. However, in an evolution of concepts, ensuring optimum availability of rotating machines is not enough to correct faults. Maintenance has moved from corrective maintenance to predictive maintenance. For bearings and other machine elements there are condition-based maintenance techniques that allow early detection of faults.

Vibration and acoustic measurement techniques for early detection and diagnosis of faults in bearings are widely discussed in the literature [1]. Besides these fundamental techniques, the artificial intelligence methods have given a strong contribution to the early detection and automatic diagnosis of fault in rotating machines in general and