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3	PhD Thesis Title	Applications of Artificial Nueral Network and Wavelet Transform for Vibration Monitoring of Rotating Machinery	
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7	Brief synopsis		

Condition monitoring of rotating machinery plays a vital role in preventing catastrophic failures and reducing machine down time. In industrial plants, a number of methods like vibration monitoring, noise monitoring, acoustic emission, wear debris analysis, lubricant analysis, temperature monitoring, corrosion monitoring and performance parameters etc., are monitored continuously or periodically, to give an idea of the health of the machine. Vibration-monitoring is a useful technique for diagnosing of faults in rotating machines and provides valuable information regarding symptoms of machinery failures. This may avoid costly break downs. There is also need for diagnostic systems like artificial neural network and wavelet transform.

The present work involves the simulation of rotor faults and studying their effects on the frequency components of vibration signals. The diagnostics of rotor faults has gained importance in recent years. Many papers in the literature have dealt with single faults, but normally more than one fault can occur in a rotor. The vibration analysis of rotating machinery can give an indication of the condition of potential faults such as unbalance, bent shaft, shaft crack, bearing clearance, rotor rub, combined unbalance and shaft bow, and shaft crack, and bearing clearance, combined shaft crack and bearing clearance. Artificial neural network (ANN) and wavelet transform (WT) have been applied for quantifying and classifying the rotor faults using frequency domain data.

The experimental studies of the above faults are carried out. The rotor test rig is used to simulate the above mentioned rotor faults. The frequency analysis of the vibration signatures due to these faults has been carried out. In case of rotor rub, the effects have also been studied on the shape of orbits of shaft center motion. The experimental simulation studies of the rotor faults have shown that the faults affect the magnitude of the various harmonics of vibration signatures significantly. Further, the shapes of orbits in the case of rub are also affected.

This work also describes the application of Artificial Neural Network (ANN) for the prediction of the effect of individual and combined faults of rotor on the frequency components of vibration signature of the rotating machinery. The characteristic features of frequency domain vibration signals have been used as inputs to the ANN. The network consists of one input, one hidden and one-output layers. The ANN is used for diagnosis and quantifying of faults. The network is trained using multilayer feed forward back propagation. Levenberg Marquardt algorithm is used to diagnose the rotating machinery faults using frequency domain data as input to train the network. The faults like unbalance, bent shaft, shaft crack, bearing clearance, rotor rub, combined unbalance and shaft bow, combined unbalance and shaft crack, combined unbalance and bearing clearance, combined shaft crack and bearing clearance and classification of afore mentioned combined faults are studied. The networks have been trained and tested with error goals and neurons.

A new technique combining the wavelet transforms (WT) with Artificial Neural Network (ANN) is applied for the prediction of the effect of combined faults of unbalance and shaft bow and unbalance and shaft crack on the frequency components of vibration signature of the rotating machinery is used. The wavelet transform approach enables the discrete manner observation of different frequency components over the full spectrum. This method is tested successfully for combined faults of unbalance and shaft bow and unbalance and shaft crack.