

Chapter 6

Conclusions and Future Scope

6.1 Conclusions

Thermal model of induction motor and parameters' identification using PSO algorithm was carried out. The obtained result exhibits the satisfactory performance for the parameter identification scheme.

The protection scheme implemented explores the advantage of signal processing algorithm which is the correct indicator of discrimination of voltage unbalance and mechanical overload. The amplitude obtained by short time Fourier transform with respect to different windows with clear explanation of its performance after the sampled data is obtained. It is processed with STFT in order to get the magnitude and phase of the signal. Finally the discrimination between voltage unbalance and overload as mentioned with additional SF, is considered for accurate discrimination of these two disturbances. The case study with its comprehensive analysis clearly indicates the efficacy of the proposed scheme.

Further, inter-turn fault which is important and probable cause of insulation failure in induction motor is discussed by its detailed modelling. The experimental prototype was made in electrical machine lab and subsequent signal was retrieved for classification objective. In the steady state the current signal from the hardware setup is obtained in a 16 channel CRO, which indicates the clear phenomenon of steady state scenario. Further the tapping at 5%, 10%, 15% and 20% are created in one phase of induction motor and corresponding signal is retrieved subjected to short at a particular phase. Thus, the signal retrieved after the short circuit indicates the fault scenario and the corresponding FFT analysis is done to evaluate the harmonic content of the signal by

means of THD. Further, the intelligent pattern classification scheme such as ANN, SVM was considered for subsequent classification of the inter-turn fault. The obtained results clearly indicates the discrimination between faulty and healthy condition. The classification accuracy of SVM is found better than that of ANN.

Since the induction motors are frequently used machines in industrial sectors and play a dominant role in many fields. Though industrial induction machines have excellent reliability, yet they have several maintenance problems. Due to failures and maintenance of machines and excessive maintenance cost per financial year increases tremendously. In this thesis, an attempt is made to comprehensively discuss the reliability, MTBF, and failure rate of induction motors have been evaluated with the help of the industrial data. It has also been described mathematically how the purchase of a standby machine increases the reliability of system operation. For various failure modes, preventive and suggestive methods are demonstrated in order to reduce the faults in induction machines. The reliability indices (reliability, MTBF and failure rate) v/s operational time curve based on probabilistic evaluation has been demonstrated successfully. These curves are very helpful to provide insights about the planning maintenance schedules to obtain reliable operation without interruption.

6.2 Future Scope

- The RBFNN and SVM can be applied for the detection and location of other failure like bearing failure, broken rotor bar failure, and eccentricity related failure of an induction motor.
- DWT can also be used for the identification of several other rotor and stator related failures in induction motor based on vibration and current signature of the induction motor.

- The Advanced signal processing techniques can be applied for the detection and location of other failures like bearing, broken rotor bar, and eccentricity related failure of an induction motor.
- DWT, EMD can also be used for identification of several other rotor and stator related failures in induction motor based on vibration and current signature.
- The HIL can be built up with different advance protection scheme and disturbance detection in dSPACE platform .
- Fusion technique such as combination of different pattern recognition can be implemented for classification objective in context of different failures that do occur in induction motor.