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Title:

Stator Faults Diagnosis and Protection in Three Phase Induction Motor Based on Wavelet Theory Machine

Abstract:

Induction motor faces various stresses during operation conditions. The conditions of monitoring, diagnosis of faults and protection become needful in order to avoid tragic failures. Stator faults show responsible for most of the faults in an induction motor. The stator winding faults are generally concerning with insulation failures which are usually known inter-turn, phase-to- phase, phase-to-ground and loss phase faults.

Initially, in this work, the mathematical model of the three-phase induction motor is set up in matlab/Simulink to represent its healthy and faulty conditions for the stator fault of the induction motor. A collected data from normal and various faults is employed for choosing both the optimized mother wavelet and a number of level of decomposition according to Multi-resolution analysis (MSR) and non-normalized Shannon criterions respectively. A wavelet packet transform (WPT) algorithm is proposed to derive certain features for induction motor line currents to detect the healthy and faulty conditions and diagnosis the type of faults.

In practical experimental, an induction motor is chosen with unknown parameters with a general specification 1hp, 3-ph, 380V, 50Hz, 1500rpm. It is a rewinded motor that realizes a different requirement which has many output terminals from its winding in order to implement the various faults which wanted for studies. Then, the various faults can be implemented actually without any approximation. The 3-phase current signals are detected through three phase CT's and converted through A/D converter by using LabJack U3-HV device.

The Artificial Neural Network (ANN) presents a based approach for protecting and diagnosing of the stator faults of the induction motor. The WPT and entropy based method is proposed to select an input features of the network which reduces the size of the input features without losing the characteristics of the signal which applied on the coefficients of the second level of the decomposition currents (optimal level selection). The data required to develop the ANN network are generated by simulating various faults in the test system. The simulation results show that the proposed method provides a robust and accurate for protection and diagnosis with different motor transient cases. In order to reduce the fault detection time which is around quarter cycle in the mathematical model, an adoption of a new technique which moves a frame sample of

the currents is used. The WPT algorithm is developed to issue online software message that flagging fault, where the diagnosing fault type monitors on the creating caution window. The tripping decision is back to the LabJack U3-HV device which is used as feedback of pulse to the NPN relay switch circuit. It controls the circuit breaker to isolate the main supply when a fault is occurring. The interlock between the WPT algorithm and the induction motor starter is used to brake the WPT algorithm program when trusts that the main contactor switches are energized the power supply.

In an attempt to study the faulty condition which may accrue at starting time, the proposed WPT algorithm is developed based on signature starting current analysis under different transient faults for diagnostic purposes. The algorithm is applied to detect a healthy motor from the stator damaged motor. This thesis contains the side effect study on the WPT algorithm proposed for the sudden load testing of the induction motor that leads the hoisting mechanisms load application which supposed to represent a healthy condition operation.