ABSTRACT:

Direct Torque Control (DTC) is one of the most recent techniques of the control of Induction Motors. It carries out a precise and quick control of the stator flux and electromagnetic torque of induction motor. In principle, moreover, DTC operation requires only the knowledge of the stator resistance. Variation of stator resistance deteriorates the drive performance especially in low speed region. A few control schems have been proposed to overcome this parameter sensivity, which restricts the speed control range of the drive. The main purpose of this thesis is investigation on the effects of stator resistance variation on performance of DTC system and using one proposed method for stator resistance tuning in a practical system.

According to machine state equations, we did a computer-basd digital simulation, which sampling frequency was adjustable. Simulation results show that DTC has a good performance and fast dynamic for controlling stator flux and torque. Then effects of stator resistance variation was studied in different motor and controller conditions. The simulation results show that if the stator resistance increase from measured value, the stator flux and torque developed by machine will decrease; and if the stator resistance decreases, DTC system becomes unstable. Stator resistance PI estimator is one of the proposed methods to overcome this problem. Due to it's simple structure for practical implementation, this method is selected for study. If motor develop it's flux reference and torque reference, the stator current phasor magnitude is constant in steady state and can be obtained from motor parameter's and flux and torque references. Stator current is sensitive to variation of stator resistance and with this error stator resistance variation can be estimated using PI controller. It is shown that due to ripples in torque, the reference value of the stator current and it's measured value are not equal and have error which lead to improper working of PI controller. Effects of motor speed, sampling frequency and inverter switching method on performance of PI controller and DTC system are studied. The results show that PI controller has not a good performance for practical implementation. At the end experimental implementation of the DTC was carried out to verify the simulation results. The DTC were implemented with ADMC331 motor control DSP board and it operates at 10KHz sampling frequency.