

## DIRECT TORQUE CONTROL OF INDUCTION MOTOR

### ABSTRACT:

At present, induction motors are the dominant drives in various industries around the world, owing to their rugged construction and easy maintenance. However, it is quite cumbersome to control an induction motor because of its poor dynamic response in comparison to the DC motor drives. Consequent to the painstaking research put in by Power Electronic engineers around the globe, the dynamic response of an induction motor is brought on par to that of a separately excited DC motor drive.

Earlier, scalar controlled drives such as a simple V/Hz control is used to control the induction motor. While this method is simple to implement, it results in a poor dynamic response of the torque developed by the motor. In 1971, Blaschke had shown that it is, in principle, possible to derive a DC-motor like response from an induction motor by resorting to the Vector control. The central theme of vector control is to decouple the stator current of the induction motor into two orthogonal components and is to control these two components individually so as to achieve an independent control of flux and torque of the induction motor. Though this method imparts a much better elegance to the dynamics of induction motors, it required a very complex processing of signals. Interest in the implementation of vector control was renewed with the advancements in technology, such as Digital Signal Processors, as they facilitated an easy and flexible control.

However, the vector control is still very complex to implement. This motivated engineers to look for alternative solutions for an enhanced performance with a little computational overhead on the digital control platform. As a consequence of the perseverant efforts of various research engineers, an improvised scalar method known as Direct Torque Control (DTC) was invented. This method considerably alleviates the computational burden on the control platform while giving a performance which is comparable to that of a vector controlled drive.

With the DTC scheme employing a Voltage Source Inverter (VSI), it is possible to control directly the stator flux linkage and the electromagnetic torque by the optimum selection of inverter switching vectors. The selection of inverter switching vector is made

to restrict the flux and torque errors within the respective flux and torque hysteresis bands. This achieves a fast torque response, low inverter switching frequency and low harmonic losses. The modeling and simulation of an induction motor drive employing DTC is performed and the results are reported.

