

AN ABSTRACT OF A THESIS

MODELLING AND CONTROL OF SPARSE CONVERTER FED INDUCTION MOTOR DRIVES

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A front end-rectifier followed by a pulse width modulated voltage source inverter (VSI-PWM) has been well-established power converter configuration for many industrial drives. The increasing costs on the utility usage, due to power quality regulations and the need to improve the VA capacity of systems, have increased the interest in the development of power electronic equipment with power factor quality capability. Electrical motors consume a large amount of the available electrical energy and this energy tends to increase due to the massive emerging applications of electrical motor drives, in appliances and in industrial processes. Therefore, the improvement of the power factor of these low power drive systems, usually in the range from fractional horsepower to one horsepower is of particular interest. For these power ratings, the system configuration usually comprises a single-phase to three-phase type of converter with additional circuitry for power factor control. However this approach has an impact on the system cost and packaging.

In the present work a way to integrate the motor and power factor control has been presented by using a single phase to three-phase converter topology, which involves reduced number of switching devices. Unlike other configurations using extra switches and or extra boost inductor, in this circuit the boost action for input current shaping was done by the motor leakage inductances. Three such converter topologies, which use reduced number of switching devices, were presented along with their power factor control and motor control scheme. The proposed schemes were shown to achieve unity power factor operation at the supply side and high performance control of the motor drive.