Starting and Operation of a Switched capacitor Single-Phase Induction Motor Using Electronic Techniques

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Abstract

The single-phase induction motor (SPIM) is one of the most widely used types of motors in developing countries like Tanzania where industry is at its infancy. Following the strong drive towards rural electrification, SPIM applications are expected to rise especially in households and the agricultural sector. However, the starting of this motor has been a problem. Either a large starting capacitor and a smaller running capacitor together with a centrifugal switch or a large permanently connected capacitor has been employed for starting and running the single-phase induction motor. This dissertation discusses the possibility of using a simple electronic switch comprising of a triac in parallel with a small capacitor to replace this conventional method. By varying the shorting interval of the triac, the effective capacitance can be adjusted or varied. This makes it possible to set the starting and running torques to the most optimal value at a given speed. With this scheme, it is possible to operate the motor at different speeds by connecting the electronic switch in different configurations. This method adds considerable flexibility to the drive system and has the added advantage that a wide range of speed control can be obtained. Computer simulation results are presented and shown to be in close agreement with laboratory test results.

Keywords: Electronic Techniques; Single-Phase Induction Motor; Switched capacitor; Starting; Operation