Reduction of Harmonics in 3-Phase Squirrel Cage Induction Motor by using VFD Method

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Abstract: *This project aims to explore and implement effective strategies for the reduction of harmonics in three phase squirrel cage induction motors using the VFD method. By leveraging advanced pulse width modulation (PWM) techniques within VFDs, it is possible to significantly lower total harmonic distortion (THD), thereby enhancing the efficiency and lifespan of the motor. The study includes an analysis of harmonic reduction methods, simulation results, and practical recommendations, with a goal to improve overall power quality and maintain the stable operation of industrial motor drives. Harmonic distortion is a well-known challenge in the operation of three phase squirrel cage induction motors, which are central to many industrial applications due to their robust construction, efficient performance, and low maintenance needs. When these motors are powered using Variable Frequency Drives (VFDs), while variable speed control and energy efficiency are achieved, the inverter switching process inadvertently introduces harmonic components into the current and voltage supplied to the motor. Such harmonics, especially of lower order like the 5th and 7th, can cause increased heating, additional core losses, torque pulsations, and noise, ultimately reducing motor efficiency and lifespan.*

Keywords: VFD – Variable Frequency Drive, Harmonics – Harmonics are unwanted voltage or current components, Motor – Converts electrical power into mechanical movement., PWM – Pulse Width Modulation