Abstract

Induction motor designs with a higher number of phases have the potential to improve the power-to-size ratio. Along with an increase in phases a detailed analysis of motor winding is required to achieve effective implementations. Theory suggests winding design can be optimized to produce increased efficiency and torque performance.

Methodology

Computer simulation is employed to determine flux density using the theory developed. Actual experiments with custom built test equipment were performed to verify validity of the theory.

Results

The simulation of a coil with a 10 mm radius, 0.6 mm (dia.) wire, and 12 mm overall length shows the magnetic flux density at a given point on the center axis as a function of the number of turns. At 260 turns the flux density is 58% of what would be expected given by the linear function, depicted by the dashed line in graph G-2.

Multiple custom built test stands have been developed to measure the magnetic flux density, however reliable data has not yet been obtained.

Future Work

Design and build more accurate test equipment to verify theory and extend it to dynamic magnetic field cases. Computer software for winding optimizations will be developed for use in the design and implementation of a 9-phase induction motor as seen in figures F-3 with integrated phase controllers.

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References