Modification of Squirrel Cage and Slip Ring Induction Motors for a Higher Efficiency and Starting Torque

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Two major induction motor designs exist, the first being the squirrel cage induction motor with high efficiency and a poor starting torque, and the second being the slip-ring motor with a greater starting torque but poorer efficiency. The goal is to create a third electric motor that has the high efficiency of a squirrel cage induction motor as well as the higher starting torque of a slip-ring motor. Squirrel cage and slip-ring motors were constructed. The metal stator and rotor plates were cut out of steel and stacked together. Copper coils were wound through the slots of the stator. The squirrel cage motor has aluminum bars in the rotor, while the other two designs have coils in the rotor. The second rotor design has slip rings, while the third will have a different mechanism to take its function. To give a proper comparison of each of the designs the same stator was used while the rotors were swapped as they are the only part that needed to be changed in all three designs. The efficiency, starting torque, RPM, and slip were recorded. RPM was measured with a tachometer, and a prony brake was constructed for measuring torque. At this moment, the first and second rotor designs are working with the data recorded. The slip (loss of theoretical speed and a reflector of efficiency) was determined for the designs. During the initial motor testing, with an operating frequency of 50 to 100 Hz, the slip changed from 30 to 33% with the squirrel cage rotor. After major improvements in the design and balancing of the motor, tests with the slip-ring rotor showed significant improvement with the slip as low as 7.92%. The construction of the third motor is in the final stages. This research has major implications for industrial use, ranging from factories to electric vehicles.