ANALYSIS OF THE ROTOR SLOT SHAPE OF A SQUIRREL-CAGE INDUCTION MOTOR

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The shape of the slot of the squirrel-cage rotor is determined by the requirements for the starting characteristics of the induction motor and its power. In induction motors with a power of up to 50 – 60 kW, oval slots and cast aluminum windings are made. The slot dimensions are chosen so that the rotor tooth has parallel faces.

The rounding of the oval slot is carried out in its upper part and at the base of the slot. At the base, the rounding diameter should be at least 2.5 – 3 mm. This size of rounding is taken into account the technological capabilities.

To increase the starting torque of the motor, the rotor slots are made narrow and deep. The current displacement effect in them increases with increasing slot height. Rotors with such grooves are called deep-slotted.

In induction motors with a small number of poles, it is often not possible to obtain the required starting torque even with deep-slotted rotors. To do this, they switch to rotors with figured grooves. Different configurations of figured grooves are used. They have a characteristic feature – a reduced width of the upper part of the groove compared to the lower one. This makes it possible to use the current displacement effect at large slips.

Squirrel-cage rotor windings with trapezoidal slots are made either with aluminum poured into the grooves or with a welded copper cage. The rods are made of busbar copper with a suitable profile.

Windings with rods of more complex shapes, for example, blade rods, are made by filling with aluminum or its alloys. Flask-shaped slots with a round bottom part are almost never used at present due to the less successful use of steel in the tooth zone than with blade grooves.

Each rotor slot shape has its own calculation difficulties. It is necessary to take into account the influence of slot geometry on the current distribution in the rods. For more accurate calculations, it is better to use modern modeling methods.

With the development of modeling tools, as well as increased requirements for the accuracy of modeling and development of electrical machines, it is recommended to use modern modeling software. They allow you to calculate the electromagnetic parameters of the motor without creating them in real life.

One of the variants of the methodology for calculating magnetic systems that are part of electric machines is the use of the finite element method for modeling the electromagnetic field. The ANSYS Motor-CAD software is recommended as a tool for calculating the mathematical model of a squirrel-cage induction motor. It uses the finite element method to perform different electromagnetic calculations. This product was chosen due to its widespread use, wide capabilities, and user-friendly interface.