

Loss Approximation in Induction Machines

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Abstract

Electrical machines are widely used in e-mobility, especially to drive electric cars or autonomous vehicles. The accurate knowledge of the loss components is essential already in the design stage.

The full paper shows an iron loss estimation in the ferromagnetic steel laminations of an asynchronous machine by developing a two-step method to deal with eddy currents and hysteresis effects.

In the first step, the approximate magnetic field distribution inside the motor is calculated. It can be performed by a two-dimensional simulation or by a three-dimensional calculation. Latter is assuming a bulk material having anisotropic conductivity and laminates are not taken into account. In the second step, the eddy current field inside the individual laminates is modeled. The boundary conditions of any individual sheets are obtained from the bulk model. The eddy current model employs the finite element method to consider the three-dimensional current distribution in the steel sheets. The hysteresis losses are obtained from a vector Jiles-Atherton hysteresis model.

Results obtained from different kind of software tools are compared.

References

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