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Stress Analysis of Induction Motor Core Considering Anisotropic Magnetic and Magnetostrictive Properties

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In order to control and reduce the electromagnetic vibration of induction motors, the stress in motors cores, which is the inherent reason of vibration, should be computed accurately. Stress in induction motors is mainly generated from Maxwell electromagnetic force between the stator and rotor under the rotational magnetization excitation. The non-oriented silicon steel in motors shows different magnetic characteristics between rotational magnetization excitation and the alternating one, which has remarkable effect on the magnetic field and stress computation. However, the influence of rotational magnetic characteristics has not been considered in the past studies of motors vibration. This paper tests magnetization properties of non-oriented silicon steel sheet under different rotational mgnetic field to suport the stress computation. Based on the measured constitutive relations, an electromagneto-mechanical coupled numerical model for induction motors is presented. Under the rotational magnetization excitation，stress distribution on the motor cores is calculated. In order to study the influence of rotational magnetization characterastics on the stress dstribution of motors cores, another model, which uses magnetic characteristics under alternating magnetization excitation instead of the rotational ones, is calculated, too. By comparing the computation results, it can be seen that the rotational magnetization characterastics greatly influence the stress distribution of motors cores.

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