Karlsruher Institut für Technologie

Elektrotechnisches Institut

Masterarbeit

Analyses of rotor stress and motor natural frequencies of an interior permanent-magnet high-speed synchronous motor

Themenbereich

Mechanical analysis

Schwerpunkte

- ☒ Theorie
- ☒ Literatur
- ☒ Simulation
- ☐ Programmierung
- ☐ Konstruktion
- ☐ Hardware
- ☐ Versuche

Studiengang

- ☒ Elektrotechnik
- ☒ Maschinenbau
- ☐ Mathematik
- ☐ Informatik

Beginn

Ab sofort

Ansprechpartner

M.Eng. Jing Ou

Raum 118

Tel: 0721 608-41783

jing.ou@kit.edu

http://www.eti.kit.edu

Motivation

The design of an electrical machine includes electromagnetic, mechanical, and thermal designs. Currently, high speed is one of the development trends of electrical machines as it can help to increase the power density of the machines. In this case, mechanical design plays a more important role because mechanical aspects limit the speed and the power of the machine. Firstly, the centrifugal force at a high speed in the rotor may destroy the rotor, which limits the rotor diameter. Secondly, in order to avoid resonance of the motor, the natural frequencies of the rotor should be higher than the fundamental frequency. Then, the length of the rotor is limited in order to obtain high stiffness. Thus, mechanical analysis is significantly important for the high-speed motor design.

Aufgabenstellung

In this work, three aspects need to be done regarding the stress on the rotor and the motor natural frequencies.

1. The stress on the rotor core will be analyzed. It is recommended using an analytical method to calculate the stress on the rotor core. Then, the parameters of the rotor core, the shaft and the PM can be optimized through the analytical method.
2. The rotor natural frequencies need to be calculated.
3. The natural frequencies of the whole motor need to be analyzed. In this case, the bearing will be considered.