TECHNISCHE UNIVERSITÄT DARMSTADT

Institut für Elektrische Energiewandlung

Bachelor work

„Measuring and calculating the electric contact resistance between mechanically rolling rings“

Background

Electric currents are induced in the bearings of inverted-fed electrical AC machines due to common-mode (CM) voltage of the feeding power-electronic inverters. If the apparent bearing current density exceeds ca. 0.3 A/mm^2, the bearings in the electrical machines suffer from the induced electrical current flow, disturbing the bearing operation gradually by damaging the bearing surface and/or by degrading the lubrication material. The bearing surface may be deformed and shows fluting. Then the bearing vibrates, gets noisy. It suffers from increased friction losses, which eventually lead to mechanical breaking.

The understanding of the electrical characteristics of the bearing at DC and low AC frequencies helps to understand the effect of the high frequency inverter-fed bearing currents.

In the institute for Electrical Energy Conversion at TU Darmstadt, a test rig is available to measure the electrical contact voltage and current for a set speed and force.

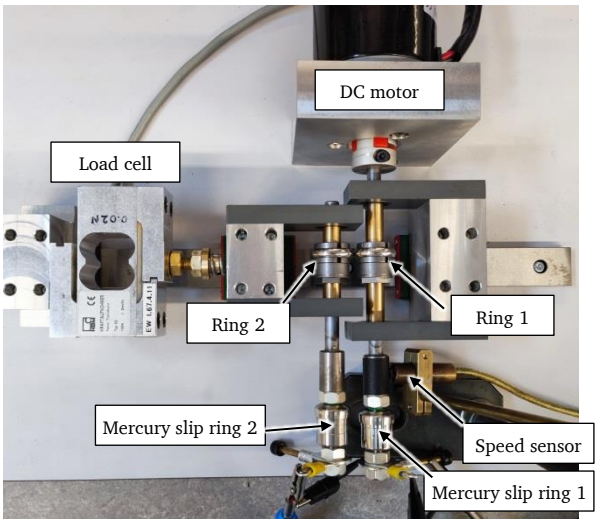

Fig. 1. Ring-Ring test rig to measure the electric contact current and voltage between two rolling rings.

Tasks

1) The contact resistance and contact voltage are measured between the rolling rings of the materials: Steel 100Cr6, Steel ST52, Silver, Copper, Aluminum, for all the combinations. The influence of rotational speed and contact force is investigated. The detailed measuring conditions are determined based on the first measuring results within the project time.

2) The contact voltages for the given currents are interpreted. The contact resistance is calculated analytically based on literature and compared with the measured contact resistance. An agreement between the measurements and calculations must be achieved. (some essential keywords in the literature for this topic: fritting, oxide layer, tunneling, a-spot, constriction resistance)

3) A PI speed regulator for the DC motor is built via a micro controller using the feedback of the speed sensors.

Advisor

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