Bachelor work:

TECHNISCHE
UNIVERSITÄT
DARMSTADT

Institut für
Elektrische
Energiewandlung

Electrical properties of the bearing surface to calculate the bearing current: Identification and Simulation

M.Sc. Omid Safdarzadeh S3 10|316 Date: 30.04.2020

Motivation: In the electrical machines a voltage could be induced on the bearings, leading to electrical current through the bearing. Bearing current could damage the surface of the bearing. It leads to frequent maintenance and replacement of the bearings. Saving the bearing from electrical damages could contribute to lifetime of the machine and saving the costs.

To study the bearing in the electrical point of view, one needs to identify correctly the materials composing the system in different operating conditions. The typical bearing composed of two rings and some balls in between. The rings can rotate against each other, while the balls covered in lubrication are rolling in between to minimize the friction. The balls and rings basically touch each other

The contact Area

in the contact areas. The surface of the materials in the contact area could have a different property versus the material itself. Because a layer of oxide allegedly covers the surface. And the oxide layer unlike the steel is not conductive. Moreover there is a layer of non-conductive oil distributed unevenly between the surfaces.
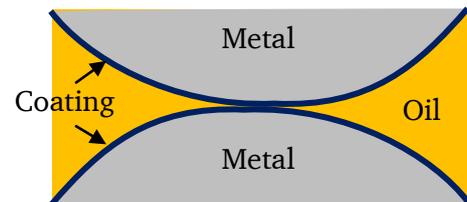
Tasks:
- To have an overview on the mechanics of the roll bearings.
- To have an overview on the electrical circuit and modeling of the electrical bearing current
- To study the material properties of the bearing and the its coatings (the chemical properties of the coating is considered usually as industry secret, not published by every manufacturer, however the general identification of the coating properties could be obtained in the vast publications)
- To simulate the bearing surface in JMAG assigning the realistic material properties and dimensions (the bearing surface data is already measured and available in EW Institute to build up the FEM model).

Requirements:
- Being familiar with basic operations in the MATLAB and JMAG softwares