Universität Stuttgart
Institut für Elektrische
Energiewandlung

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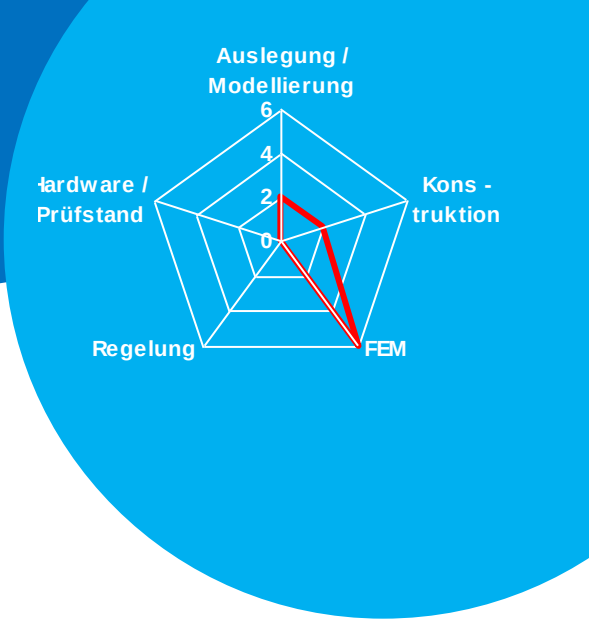

Investigation of a material cube made of recycled, compacted chips in use in a ring core sample using numerical field calculations

The conventional recycling route for electrical steel produced as waste during punching or lasering is re-melting. This is synonymous with high energy consumption and high CO2 emissions. For this reason, a new type of material is to be investigated that can save > 80% energy and CO2 compared to the conventional process.

In order to characterize the resulting material, an electromagnetic simulation of the composite material at micro level is to be produced to assess the chip shape. The parameters chip length, chip thickness, insulation layer thickness and the material composition of the original material are to be investigated. The aim here is to achieve the highest possible saturation flux density and to reduce eddy current losses.

Subsequently, different orientation directions are modeled for a selected chip shape in order to be able to evaluate any preferred directions of the magnetic flux as well as the effective reduction of iron losses in three-dimensional flow.

Student profile:

- Basic knowledge of finite element methods and electrodynamics
- Experience with numerical field simulations (COMSOL Multiphysics)
- Experience with Matlab desirable
- Structured, independent and thorough way of working

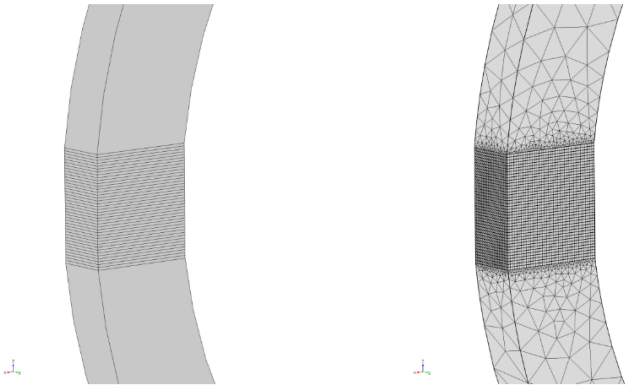

Fig. 1: Exemplary geometric modeling of a material cube in a toroidal core (left) and its meshing (right)

Work packages:

- Familiarization with the topic, literature and FEM environment
- Investigation oft he modeling methods of various micro and macro materials in COMSOL
- Preparation of several parameter studies to investigate advantageous chip properties
- Optional: Optimization of the chip shape using suitable algorithms
- Detailed documentation and code preparation

Project framework:

Aktivmaterialien aus gepressten Spänen (AmagS)

DBU
Deutsche
Bundesstiftung Umwelt

Ansprechpartner:
steffen.weigel@iew.uni-stuttgart.de

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