

WIAS-MeFreSim

3D-Simulation of Multifrequency Induction Hardening

Our Software

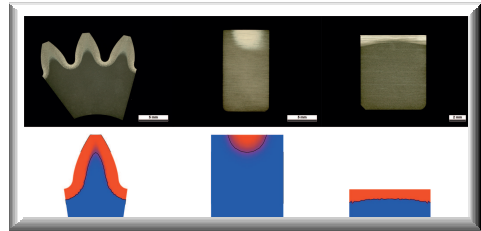
WIAS-MeFreSim allows for the 3D-simulation of induction hardening for workpieces made of steel using single- and multifrequency currents. With the help of simulations, an efficient determination of optimal process parameters for contour hardening of gears is possible, since time and cost intensive experiments can be reduced. In addition to the determination of the temperature and the hardening profile, the determination of residual stresses after the quenching process is possible.



Induction heat treatment for a gear

Background

WIAS-MeFreSim is used for the simulation of induction heat treatment for workpieces made of steel. It is the aim of the heat treatment to produce workpieces with hard, wear resistant surface and soft, ductile core. The boundary layer of the workpiece is heated up by induced eddy currents and rapidly cooled down by the subsequent quenching process. The resulting solid-solid phase transitions lead to a hardening of the surface of the workpiece.



Comparison between experiment and simulation for a gear, hardening profile in cross section and lateral cuts of tip and root of the gear

Features

- Determination of electromagnetic fields, temperature and the phase fraction profile in the workpiece and of mechanical stresses and deformations
- Determination of the physical fields by using adaptive finite element methods
- 3D-visualisation of results
- Extensible database for material parameters and transformation kinetics for various types of steel
- Experimentally verified simulation results

Our Services

- Individual consulting and realisation of simulations for the induction heat treatment
- Concerted further development including acquisition of public funding

Prof. Dr. Dietmar Hömberg, Dr. Thomas Petzold

Weierstrass Institute for Applied Analysis and Stochastics · Mohrenstraße 39 · 10117 Berlin · Germany
 Fon 030 203 72-491 · hoemberg@wias-berlin.de, petzold@wias-berlin.de