

A novel austempering treatment of bainitic bearing steel

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Project summary

Ball/roller bearings are widely used in rotary structures of wind turbines, vehicles, trains, and aircrafts. Modern industry requires increased performance of bearings used under conditions of heavy loads and or high rotary speeds, these severe conditions cause accelerated failures due to rolling contact fatigue. Our recent research has shown that, the strength, hardness and toughness properties of steels can be greatly improved using advanced heat treatment processes, such as a duplex process of austempering and quenching-tempering, to replace the conventional hardening process of quenching-tempering.

This project aims to investigate the feasibility of low-temperature austempering heat treatments in developing nano-structured bainitic/martensitic/austenitic multi-phase microstructure of bearing steel. The project work will employ a commercial grade of bearing steel GCr15MnSi. The steel has been provided by our research partner, National Laboratory for Bearing Tribology in Henan University of Science and technology. A series of heat treatments will be conducted in the university laboratory, followed by metallography examinations of microstructure and hardness testing.

The preliminary results obtained from the project will contribute to the knowledge on the relationship between the process temperature and time, the martensite/bainite/austenite microstructure, and the hardness property. Selected heat treatment conditions will also be subjected to further research on extensive microstructure characterisation by means of electron microscopy, crystallographic analysis and wear resistance studies.

The project will also reverse engineer a used high-performance bearing taken from China high-speed train which would provide insights into real world bearing behaviour.

Specific skills and experience required for this project

Please also refer to the advert on our jobs pages for the person specification for these internships

- Strong willingness to develop laboratory skills in materials engineering.
- Undergraduate level study in a subject of engineering materials, mechanical engineering, aerospace technology, or chemical engineering.
- Knowledge of engineering materials.
- Ability to work independently and communicate clearly

- Basic laboratory skills in metallography sample preparation, hardness testing, and heat treatments. Basic experiences in literature searching and reading, writing experiment report and project management.

Project location

City Campus

Home working may be available

Project delivery

The project can be delivered full-time for 6 weeks or part-time (minimum 2 days a week) in an equivalent duration.