WWHK
Werkstoffkunde & Werkstoffprüfung
Materials Science & Materials Testing

Hochschule Kaiserslautern
University of Applied Sciences

Conceptual design and construction of an adapter plate for the mechanical examination of steel cables and creation of evaluation criteria for the remaining service life

As a result of fatigue processes in metallic materials, material failure can already occur determined strength parameters. Consequently, an in-depth understanding of the microstructural mechanisms is of crucial importance in order to ensure a reliable component design. The design of dynamically stressed components is usually based on a Wöhler curve, which reflects the relationship between the applied stress amplitude and the corresponding number of cycles to failurebelow quasi-statically .

Within the scope of this student project, is to the fatigue behaviourof steel cables be investigated. For this purpose, a methodology must be developed that provides reliable damage detection and assessment. By understanding the material degradation, an optimised component design and an evaluation of the component integrity is made possible.

The first part of the task isto design an adapter plate that allows the steel cable to be installed in the testing machine. In addition to a suitable adapter geometry, the choice of material, considering the forces that occur, is of decisive importance, which is why a CAD design is created on the basis of all relevant calculations of the components used (screw connections, bolts, cotter pins, stress concentrations that occur, etc.). Furthermore, for in-situ measurement of the electrical resistance, which conclusions to be drawn about the electrical insulation is required allows cyclic deformation behaviour.dynamic

The second part of the work consists of the development of a method whereby relevant failure criteria can be detected and evaluated. This enables the damage evolution to be recorded and the component integrity to be assessed. This monitoring of the material response as a result of dynamic loading is intended to prevent premature failure of the steel cables.

The third aspect deals with safety during the test. As travelling ropes under tension can lead to a whipping movement, appropriate safety precautions must be taken.

In the last part of the thesis, validation tests will be carried out to test the design on the one hand and to check the assessment criteria on the other.

The procedure for setting up the calculation model and the test results are to be presented in a subsequent final report + presentation.

Type of tender

- Announcement of a practical study phase (extent 15 ECTS) at the WWHK
- Invitation to tender for a practical phase + Bachelor's thesis/ Master's thesis 30 ECTS R&D module at the WWHK
- Announcement of a research & development module (extent 10 ECTS) at the WWHK (depending on the type of student work, the extent can be adjusted accordingly)

Duration: according to the PO and type of student work
Start: immediately