

MSc Assignment

EDDY CURRENT TECHNIQUE TO DETECT SURFACE CRACKS (DEFECTS) IN STEEL ROLLS

Keywords: Eddy current, Fatigue, Experiment

Sheet metal is used in numerous applications. In order to achieve the desired surface properties and dimensions of the sheet metal, cold rolling is one of the common metal forming methods in steel-making companies.

A cold rolling mill stand consists of a pair of hard rolls known as work rolls, which are the ones in contact with the sheet. Work rolls are supported by a pair of soft rolls known as backup rolls. The main role of backup rolls is to avoid any unintended bending of the work rolls and to provide precision to the final sheet dimensions and rolling process reliability. However, the life of backup rolls due to the nature of cyclic loading of rolling motion is limited by two failure mechanisms namely fatigue (cracks) and wear.

Approach

Using a two-disc experiment, mimicking the contact of work roll and backup roll, the *Surface Technology and Tribology* (STT) group investigates the influence of material, load, lubricant, and operating conditions on the damage mechanism.

A typical damage process occurs due to the initiation and propagation of fatigue cracks from the surface of the backup rolls. To find damaged areas at an early stage, when the cracks are still very small, an investigation of the surface with Eddy Current sensors is to be tested.

By using a test system and samples from the experiments the task is to investigate how to best apply the Eddy current technique for damage detection. Furthermore, the limits, resolution, and repeatability of the method for defect detection should be investigated.

Tasks:

- Literature survey
- Designing experimental test procedures
- Manufacturing specimens and experiments
 - Determination of the dependency of the eddy current signal shape on the crack angle and length
 - Obtaining the probability of detections for various operating frequencies of the eddy current
- Analyzing and discussing the obtained results
- Writing a scientific report

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