Synchrotron X-ray measurement of residual strain within the nose of a worn manganese steel railway crossing - DTU Orbit (19/12/2018)

Switches and crossings are an integral part of any railway network. Plastic deformation associated with wear and rolling contact fatigue due to repeated passage of trains cause severe damage leading to the formation of surface and sub-surface cracks which ultimately may result in rail failure. Knowledge of the internal stress distribution adds to the understanding of crack propagation and may thus help to prevent catastrophic rail failures. In this work, the residual strains inside the bulk of a damaged nose of a manganese railway crossing that was in service for five years has been investigated by using differential aperture synchrotron X-ray diffraction. The main purpose of this paper is to describe how this method allows non-destructive measurement of residual strains in selected local volumes in the bulk of the rail. Measurements were conducted on the transverse surface at a position about 6.5 mm from the rail running surface of a crossing nose. The results revealed the presence of significant compressive residual strains along the running direction of the rail.

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