Radiographic Investigation of Structural Damage on Rails

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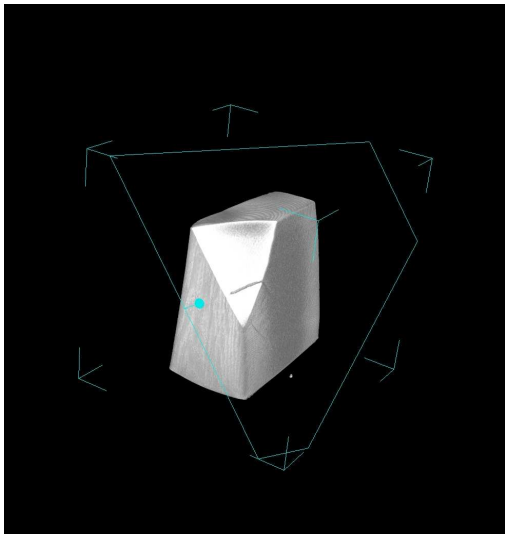
Computed tomography (CT) is suggested as an alternative method for the investigation of damage in rails, such as Rolling Contact Fatigue (RCF) cracking. CT is an automated non-destructive X-ray inspection technique that produces high-resolution 3D maps of samples. After reconstruction the sample can be viewed from any 3D angle, sliced in any direction, accurately measured and even animated in a virtual workspace. This enables detailed analysis of the internal structure of a wide range of components. Depending on the material and size of the sample, and the resolution required, a full 360° scan can be performed within 2-3 hours. The two-dimensional (2D) images collected during testing can be used for the reconstruction of 3D images of the sample. The images can be used for both surface and internal structure analysis.

Despite the considerable advances in rail metallurgy, structural defects in rails and particularly RCF remain a major safety and economic issue for the rail industry. In order to investigate the nature of RCF cracks (or head checks), rails taken from service with RCF cracking are sectioned axially, transversely, and normal to primary crack alignments, this latter, angled direction being determined by the combination of longitudinal, transverse, and spin creepage at that part of the rail surface. These angled sections are then examined using microscopy to reveal the true regularity of crack formation. Microscopical investigation of RCF cracks is an extremely laborious and time consuming task and requires considerable experience to be performed correctly. Furthermore, the examination of the sample is limited to the microscopical analysis of the surfaces of the areas in which it has been sectioned.



CT image of a steel sample containing RCF cracking.