2D and 3D characterization of rolling contact fatigue cracks in manganese steel wing rails from a crossing

Rail wheel contact at switches and crossings (S&Cs) induces impact stresses along with rolling contact stresses, resulting in plastic deformation and eventually crack formation. Damaged and deformed wing rails of a manganese steel crossing are studied and the microstructure, hardness and 3D crack network within the steel are characterized. It is found that the surface of the rail receives the maximum deformation resulting in a hardened top layer. The deformation is manifested by a high density of twins and dislocation boundaries in the micro-structure. A complex crack network is revealed in high resolution by X-ray tomography.

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