

Abstract

An innovative methodology for the assessment of material degradation and rolling contact fatigue (RCF) of rail profiles especially on frogs in Switches & Crossings (S&C) is described.

The loading capacity, the material behaviour and the realising low maintenance costs for S&C resulted to the requirements and the aim of this work.

The technical and commercial base for all investigations was, that currently about 72 500 S&C are installed in the DB network from which approximately 30 000 units are located at heavy duty traffic lines.

The project incorporates 17 different material testing's on a linear rolling load test stand with modified input data, the add-on metallographic investigation and after that, a preselection of 5 materials for test on a regular track section under operating conditions.

The first part - material tests on a test stand and the assessment of the results with the focus of a selection for a resistant frog material - is the part of this thesis.

The evaluation of the material behaviour was done by using a special test frog on the test stand under conditions by a frog of the type EH 60-500-1:12 installed in the track under traffic speed of 160 km/h.

Pearlitic and Bainitic steel grades with different material compositions and a typical Manganese steel (Mn 13) without an explosion hardened surface were compared to the standard steel grade R350HT for S&C.

Concerning the material degradation, in relation to the standard material, convinced a Bainitic steel grade with a better performance of 73 %.

Additionally for the track application, there is a special focus necessary. On the one hand, the production as a mass product and on the other hand, in comparison to the common welding technologies for the standard steel grade R350HT, the sophisticated weldability of the new bainitic material.