Harmonisation of Running Behaviour and noise measurement sites

5th conference
Transport Solutions:
from Research to Deployment
Innovate Mobility, Mobilise Innovation!
Paris - La Défense CNIT, 14 - 17 April 2014

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Limit values and assessment concept

The aim is to establish a set of common limit values and units. Based on these common limit values a common set of rules, interventions and procedures need to be developed. Previous work shows that European Railways use different maintenance and safety limit values, concepts and units. Measurement results from trains running across borders are treated differently. Different assessment quantities and limit values have been defined and different rules, interventions and procedures have been developed based on those limits.
The main aim is the harmonization of assessment quantities and limit values for overloaded vehicles and wheel defects.
The work sets out from the findings from the INNOTRACK EU project and from UIC work.
The work in in the Limit Value search will focus on vertical (impact) loads. Further, the focus is on safety /risk assessment. The results will provide a technical / scientific basis for limit values. From these tentative limits will be established. Operational consequences of these will be assessed. In addition to giving a recommendation for an alarm limit framework.
Until now the updated results of the ALC project and INNOTRACK are scrutinized. Conclusions on current practices and deterioration mechanisms are compiled. Results from INNOTRACK are further distilled to extract limit values for "worst case" and "severe case" scenarios. The severity of the phenomenon, influencing parameters, and current measurements and limit values of these parameters are estimated. Information is also collected from relevant research efforts (notably the D-RAIL EU project).

Headcracks caused by Wheeldefects

Railjet on an ÖBB Argos® Wayside-Trainmonitoringsystem

Fracture criterion

To relate fracture to a bending stress, given a certain temperature, the fracture criterion is given as

$$K_{Ib} \geq K_{Ic} - K_{It} \equiv K_{Ic,red}$$

Here K_{It} is the stress intensity from temperature loading given by ΔT, which is given as

$$\Delta T = T_n - T$$

with T the current and T_n the neutral temperature
K_{Ic} is the fracture toughness (including safety factor, influence of brittleness etc).

Fracture criterion

For a worst case (regarding time evolution of the contact load) scenario of the three vehicle models, bending moments are predicted for given impact load magnitude and ballast stiffness (K_b : 5, 10, 30 and 100 MN/m). Bending stresses and pertinent stress intensities are evaluated for given crack lengths (5, 10, 15 and 20 mm for foot cracks and 25, 30, 35 and 40 mm for head cracks). Thermal stresses and pertinent stress intensities are evaluated for two temperatures (here taken as $\Delta T = 20\ ^\circ C$ and $\Delta T = 40\ ^\circ C$) and given crack lengths. Fracture toughness is estimated (here taken as 40 MPa$\sqrt{m}$) and reduced by the thermal stress intensity.

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