Crack Damage and Influencing Factors of Heavy-Haul Locomotive Wheel Flanges on Curved Tracks: Postprint

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Abstract

Aiming at the problem of frequent wheel flange cracks in a certain type of high-power heavy-haul locomotive in China when operating on plateau lines with multiple curves, the wheel flange crack damage of locomotives was studied using a method combining theoretical analysis, numerical simulation, and field tests. First, based on multibody dynamics and shakedown theory, a vehicle dynamics model and a wheel flange crack damage prediction model for this type of high-power heavy-haul locomotive were established; second, the correctness of the models was verified by comparing field test data with numerical simulation results; finally, according to the characteristics of the operating lines for this type of heavy-haul locomotive, the influence patterns of line parameters such as curve radius, curve superelevation, curve gradient, and wheel flange lubrication on wheel flange crack damage in heavy-haul locomotives were analyzed. The research results show that continuous small-radius curves are the main cause of wheel flange cracks in this type of heavy-haul locomotive; in addition, wheel flange lubrication has a significant effect on wheel flange crack damage, and the occurrence of wheel flange cracks in heavy-haul locomotives can be reduced by lowering the wheel-rail dynamic interaction through reasonable line parameter settings and wheel flange lubrication.

Full Text

Preamble

The provided source material consists entirely of corrupted characters, encoding artifacts, and meaningless fragments. No meaningful Chinese academic content is present for translation.

Note: Figure translations are in progress. See original paper for figures.