ABSTRACT OF PAPER

Title of Paper *(limited to 15 words in CAPITALS):* **ANALYSIS OF TRACK TAMPING EFFECTIVENESS USING CONTINUOUSLY MEASURED PERFORMANCE DATA.**

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Nominated Theme: Track foundation design, maintenance and diagnostics

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Abstract *(max 350 words)*:

Settlement of ballast formations caused by the cyclic loading and vibration of network traffic, can cause degradation of railway track geometry and should therefore be systematically maintained. Tamping is an effective maintenance procedure which repacks ballast particles under sleepers in order to restore the correct geometrical position of ballasted tracks.

The goal of this work is the development of a tool to evaluate the effectiveness of the track tamping. Continuously measured performance data provided by means of instrumented ore cars (IOCs), which incorporates inherent variability within the operating environment and other uncontrollable factors, is used for the analysis.

The wagon-track dynamic interaction is studied by investigating the dynamic behaviour of the IOC's suspension system. Three modes of suspension response, i.e. rock, bounce, and spring nest deflection, are calculated to identify the representative response of the IOC at a given location. The wagon suspension response data is then utilized to identify locations where tamping has been effective, or ineffective by comparing wagon dynamic responses before and after tamping maintenance. A maintenance planning system is used to conduct predictive modeling and forecast wagon dynamic response in order to identify precedent tamping locations before they become speed restrictions. Using linear regression, the rate of track degradation over time and locations where tamping is required can be identified. The evolution of ballast behaviour when tamping is done at different degradation levels is also studied.

The results of this work facilitates the development and improvement of maintenance planning operations. The data provides the means to identify particular tamping strategies or equipment that has had a adverse impact on ballast formations. It therefore becomes feasible to develop a preventative tamping program that reduces surface and lines and consequently speed restrictions.