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ANALYSIS OF THE INFLUENCE OF THE PERMANENT DEFORMATION OF BALLAST LAYER IN THE RAILWAY TRACK DEGRADATION BASED ON NUMERICAL SIMULATIONS

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This paper presents a numerical analysis of the influence of permanent deformation of the ballast layer in the degradation of railway track.

The evolution of the deformed track profile caused by railway traffic is numerically simulated considering the permanent deformation of the ballast material in the numerical model using a deformation law that depends on the number of loading cycles and the stress state the materials are subjected to. For this study it was adopted the deformation law proposed by ORE (1970) to simulate the long term behaviour of ballast layer.

A parametric study was carried out in order to understand the influence of several parameters in the track deformation.

It was analysed the influence of the porosity of the ballast layer that is considered as a parameter in the deformation law adopted. It was also analysed the influence of an initial stabilization period of the ballast layer, discounting an initial part of the deformation law, corresponding to some number of cycles and different values were tested in this analysis. The influence of the train speed was also considered in this parametric analysis.

The study was carried out in a perfect track and in a track having an isolated defect. This way it was possible to conclude about the influence of the settlement of ballast layer in the degradation process of railway track at different stages of conservation.

ORE - Deformation properties of ballast. Laboratory and track tests (Text and appendices), 1970. Office of Research and Experiments of the International Union of Railway, Utrecht.