RAIL TRACK STRUCTURAL ANALYSIS USING THREE-DIMENSIONAL NUMERICAL MODELS

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ABSTRACT

The current competitive growth of transport systems and the rising demands placed on rail transportation, especially regarding safety, operation quality and increase of efficiency, inevitably have promoted the optimization of systems that comprise the railway infrastructure. From this perspective and taking into account the present paradigm of sustainable development, the optimization of rail track design and the reduction of its life cycle costs assume greater relevance. Attaining a better knowledge of the role of the elements that comprise structure, namely the influence of thickness and mechanical characteristics of the substructure layers, is essential to achieve such objectives.

Within this context, the analysis of numerical models is a useful tool to a better understanding of the track behaviour and thus to optimize the design of structural solutions. The present study focuses on the analysis of different track structures using three-dimensional numerical modelling, in order to reach a closer reproduction of the spatial distribution of the loads applied on the structure. For some supporting layers, linear and nonlinear constitutive laws are used to reproduce the behaviour of the granular material.

Stress and deformation results, obtained on different layers, are presented and the suitability of different solutions of track structures is discussed.

key-words: rail track, numerical modelling, nonlinear analysis, design, ballast, sub-ballast, reinforcement layers.