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THE COMPLEX PHENOMENOLOGICAL MODEL FOR PREDICTION OF INHOMOGENEOUS DEFORMATIONS OF RAILWAY BALLAST LAYER AFTER TAMPING WORKS

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Abstract:

The given article considers the method of calculating the track geometry deformation with respect to uneven accumulation of residual deformations along the track. The technique proposes two significant changes in existing approaches to calculating the efficiency of the ballast layer. The transition from the approach of allowable stresses design in the ballast layer to the deformative approach of accumulations of track geometry deformations allows us to draw conclusions regarding the intervals of track tamping and the duration of ballast layer life cycle. The transition from the determinative to probabilistic approaches makes it possible to draw conclusions not only from the average unevenness, but also with regard to all possible facts of unevenness. The method is based on the mechanism of sudden and gradual deformations occurrence, which depends on a number of key factors: dynamic stresses on the ballast, non-uniformity of track elasticity, performance of current maintenance work. Based on the experimental studies results, the dependencies of sudden deformations and the intensity of gradual deformations on the level of stress on the ballast layer were established. The experimental results of the influence of the sub-ballast base elasticity on the intensity of accumulation of residual deformations are shown. On the basis of the developed method, the prediction of track geometry deterioration for a given structure of the track, the rolling stock and the permissible level of geometric deviations for track maintenance is presented.

Key words:
prediction of track geometry deterioration, phenomenological modelling, track unevenness, uniform subsidence, inhomogeneous subgrade, tamping works

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maintenance planning of railway infrastructure (Wieczorek at al. 2018).

The purpose of further research is:

1) to determine the optimal allowable values of the vertical track unevenness for track tamping from the point of view its frequency reduction and ensuring the maximum of the ballast layer life cycle.

2) the development of the optimal strategy for current maintenance which assumes corresponding value of the maintenance criterion and aims at ensuring the maximum possible life cycle of the ballast layer.

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