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Analysis of parametric vibration of a roller coaster flexible wheel

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Abstract: The article concerns the analysis of parametric vibrations of a flexible roller coaster wheel. The analysis was carried out in the context of designing a new wheel, whose role was to ensure the reduction of vibrations of the roller coaster trucks. For this purpose, the possibility of radial deformation of the wheel is ensured by introducing susceptibility in the area between the hub and the outer surface. Such solution, with the appropriate choice of parameters, made it possible to reduce vibrations in the wheel-track system. The susceptible structure results in periodically variable stiffness of the wheel during rolling. The aim of the analysis was to determine selected parameters of the susceptible part of the wheel in such a way that the resonance vibrations would not be excited by parametric vibrations. The results of the parametric vibration analysis combined with the wheel resonance characteristics allowed for the formulation of indications for the design of the new wheel.

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