Abstract

The topic of my thesis is "Dynamics of rail vehicle-railway turnout interaction.

In the first chapter the literature on the issues of railway turnout dynamics is analysed.

Based on the literature analysis, the aim, scientific thesis and scope of the work were formulated.

The aim of the study was to investigate selected issues of railway turnout dynamics for high-speed railways using simulation processes.

The scientific thesis was formulated as follows:

It is possible to use computer tools thanks to which it will be possible to determine the dynamic parameters describing the dynamics of rail vehicle interaction when passing through a railway turnout with a radius of 1200 m.

The third chapter deals with the characteristics of a railway turnout as a mechanical system, the construction of an ordinary turnout, the parameters of a railway turnout for 1200m are presented.

The fourth chapter discusses rail vehicle-railway turnout interactions. A nominal model of a railway vehicle, a mathematical model of the railway turnout track, a mathematical model of the railway vehicle - track, a mathematical model of the passage of a railway vehicle through a railway turnout and results of simulation studies for a high-speed railway and a 1200m turnout are presented.

From the presented simulations it follows that

- the maximum running angle is for speeds around 200 km/h, for other speeds the running angle is smaller.
- the derailment ratio reaches a maximum value of 0,2 at 350 km/h
- all derailment ratio maxima are in the crossover region, identical to the run-up angle

The fifth chapter contains a review of the stability of the mathematical model of a vehicle in straight track traffic through a turnout.

It presents

- stability in the Lyapunov sense,
- asymptotic stability in the Lyapunov sense,
- stability in the Lyapunov sense under steady state disturbances
- stability in the Lagrange sense
- orbital stability
- stability in the Poisson sense
- technical stability

Stochastic technical stability, its assumptions, definitions were discussed.

The STS of a mathematical model of a rail vehicle in the post-collision motion was studied on the basis of simulation results.

The sixth chapter contains the mathematical model of the wheel-rail contact in the movement of a railway vehicle through a turnout and the forces occurring in the contact area for a railway turnout.

18.04.2021 r.