



XXVI KONFERENCJA NAUKOWA

POJAZDY SZYNOWE 2025

Zbiór streszczeń

15 - 18 września 2025, Wisła

Robert KONOWROCKI¹

Tomasz SZOLC²

PROBLEMS OF SELF-EXCITED VIBRATIONS OF AN ELECTRIC LOCOMOTIVE WHEELSET

Investigations explores the phenomenon of torsional vibrations of an electric locomotive wheelsets. A dynamic electromechanical drive model has been created and then integrated with the railway wheelset-rail system to simulate self-excited torsional vibrations of the considered system. Results of these analyses are used in order to confirm that dynamic interaction between electric motors and mechanical systems can be thoroughly investigated when sufficiently reliable physical and mathematical models of these objects are applied. From the computational results, it follows that torsional vibrations of the driven mechanical system essentially influence qualitatively and quantitatively its excitation by the electric drive motors. This motors can be effectively controlled using the $U/f = \text{const}$ principle during start-ups under initial drag torques, during synchronization to the nominal operation and under rapid over-loadings. Moreover, the following were observed: negative damping generated by the motor is responsible for operational instability of the entire drive train, and by means of a proper motor control this dangerous effect can be eliminated.

¹ Instytut Podstawowych Problemów Techniki Polskiej Akademii Nauk, Katedra Inteligentnych Technologii, Wydział Sterowania i Dynamiki Systemów, ul. Pawińskiego 5B; 02-106 Warszawa, rkonow@ippt.pan.pl

² Instytut Podstawowych Problemów Techniki Polskiej Akademii Nauk, Katedra Inteligentnych Technologii, Pracownia Sterowania i Dynamiki Układów, ul. Pawińskiego 5B; 02-106 Warszawa, tszolc@ippt.pan.pl