

Scaling Strategy of a New Experimental Rig for Wheel-Rail Contact

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Abstract : A new small-scale test rig developed for rolling contact fatigue (RCF) investigations in wheel-rail material. This paper presents the scaling strategy of the rig based on dimensional analysis and mechanical modelling. The new experimental rig is indeed a spinning frame structure with multiple wheel components over a fixed rail-track ring, capable of simulating continuous wheel-rail contact in a laboratory scale. This paper describes the dimensional design of the rig, to derive its overall scaling strategy and to determine the key elements' specifications. Finite element (FE) modelling is used to simulate the mechanical behavior of the rig with two sample scale factors of 1/5 and 1/7. The results of FE models are compared with the actual railway system to observe the effectiveness of the chosen scales. The mechanical properties of the components and variables of the system are finally determined through the design process.

Keywords : new test rig, rolling contact fatigue, rail, small scale

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