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REDUCING RAILWAY TRACK VIBRATIONS BY APPLYING PARTICLE DAMPING SYSTEMS

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Summary: The wheel-rail contact is an intrinsic characteristic of rail transport. This contact is one of the main reasons why rails are so efficient regarding transportation, mainly due to the very low friction coefficient between them and the wheels. However, this strong argument also leads to a disadvantage, the wheel contact is also associated with excessive vibration and noise, which have a strong impact in the passengers' comfort and especially in the surrounding community. These noise and vibration impact the public in several ways, like disturbing sleep, increasing stress and heart associated diseases. Moreover, excessive vibrations are strongly related to structural damages in surrounding properties. When analysing the recent expansion of railroads, it is expected that these downsides will be exacerbated, due to the anticipated increase in rail traffic and construction of new railroads inside crowded urban areas. The main goal of the present work is to investigate the rail vibration attenuation by applying particle damping systems. Four different particles will be studied, and their effectiveness in reducing the rail vibrations will be analysed for different frequencies and amplitude ranges. Moreover, studies encompassing the reservoir position, quantity and material will also be performed. Promising results were found, where in certain conditions the particle dampers were able to reduce peak vibration levels by more than an order of magnitude.