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Vertical and Lateral Vibration Response for Corrugated Track Curves Supported on High-Density Polyethylene and Hytrel Rail Pads

Authors : B.M. Balekwa, D.V.V. Kallon, D.J. Fourie

Abstract : Modal analysis is applied to establish the dynamic difference between vibration response of the rails supported on High Density Polyethylene (HDPE) and Hytrel/6358 rail pads. The experiment was conducted to obtain the results in the form of Frequency Response Functions (FRFs) in the vertical and lateral directions. Three antiresonance modes are seen in the vertical direction; one occurs at about 150 Hz when the rail resting on the Hytrel/6358 pad experiences a force mid-span. For the rail resting on this type of rail pad, no antiresonance occurs when the force is applied on the point of the rail that is resting on the pad and directly on top of a sleeper. The two antiresonance modes occur in a frequency range of 250 – 300 Hz in the vertical direction for the rail resting on HDPE pads. At resonance, the rail vibrates with a higher amplitude, but at antiresonance, the rail transmits vibration downwards to the sleepers. When the rail is at antiresonance, the stiffness of the rail pads play a vital role in terms of damping the vertical vibration to protect the sleepers. From the FRFs it is understood that the Hytrel/6358 rail pads perform better than the HDPE in terms of vertical response, given that at a lower frequency range of 0 – 300 Hz only one antiresonance mode was identified for vertical vibration of the rail supported on Hytrel/6358. This means the rail is at antiresonance only once within this frequency range and this is the only time when vibration is transmitted downwards.

Keywords : accelerance, FRF, rail corrugation, rail pad
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