

The Transverse Oscillation Of Railway Vehicles

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Abstract

This paper describes an investigation, with models and analysis, of the transverse oscillation of railway vehicles running on straight track.

The primary cause is found to be the coning of the wheels, owing to which a vehicle, once displaced sideways off the centre of the track, wanders from side to side in an approximate sine curve. The axle suspensions and axle box and bearing clearances can be arranged to damp out the oscillation at low speed; when the speed is raised these methods remain effective in bogies, but in four-wheeled vehicles high speed overcomes all control and the motion builds up to the maximum allowed by the flanges. In bogie stock suitable designs of the coach suspensions further reduces the violence of the oscillation and largely confines it to the bogies.

Wear of tyres and rails modifies the wheel-rail contact conditions, shortening the wave-length of the oscillation and making it much more violent. This is the explanation of hunting.

The effects studied here in an idealised form are an important source of trouble in practice; there are, of course, modified by the imperfections of real track and by the action of the flanges. If one wheel could be left to turn on each axle, a radical cure would be effected; this may, or may not, be a practical possibility.

As a preliminary to the main problem, the paper starts with a study of wheel adhesion and creep. It concludes with an elementary investigation of flange-climbing and side-cutting.