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Dynamic analysis of a partially filled tanker train travelling on a curved track

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Abstract

Dynamic analysis of a partially filled tanker train travelling on a curved track is studied in this paper. A partially filled tanker is dynamically modelled when it is travelling along a real curved track. For three classes of tracks, rail irregularities are randomly generated by using Monte Carlo simulation. An equivalent dynamic system is used to model the sloshing motion of the fluid. Two derailment indexes, i.e., derailment quotient and unloading ratio, are obtained numerically as safety indicators. A parametric study is carried out to investigate how different parameters such as the operational speed, fluid modelling, rail irregularities, and fluid density may affect the derailment potential. It is found that ignoring the sloshing may lead to 18% and 25% error in the calculation of derailment quotient and unloading ratio, respectively. It is also found that lowering the centre of gravity and consequently reduction of the moment arms is more dominant than the oscillating forces due to sloshing motion. © 2010 Inderscience Enterprises Ltd.

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