

铁道车辆弹性车体被动减振仿真分析

Simulation on Passive Vibration Control of Flexible Car body of Railway Passenger Vehicles Passenger Vehicles

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中文摘要

为了抑制铁道车辆车体弹性振动,提出了在车体底架下纵向安装液压减振器的方案。将车体视为均质欧拉梁,包括了结构阻尼和车体液压减振器阻尼在内,建立了刚柔耦合垂向动力学模型,采用基于虚拟激励法的平稳性快速算法,研究了车体液压减振器对车体弹性振动的影响。研究表明,车体减振器可以有效控制车体弹性振动,车体减振器阻尼系数越高,对车体刚性的要求就越低。液压减振器的安装位置分析表明,车体液压减振器越靠近车体中部,其减振性能越好。在本文的算例中,当车体减振器阻尼系数为 $N \cdot s/m$ 时,车体垂向一阶频率 6.5Hz 以上即可满足 200km/h 时速时的平稳性要求。

英文摘要

To suppress the vibration of flexible carbody of railway vehicle, it's proposed to longitudinally install damper under carbody underframe, which is called 'flexible damper'. Taking the carbody as a uniform Euler beam supported on secondary suspension, including the structure damping ratio and the flexible damper, a vertical model was built to research the effects of flexible damper on the vehicle ride quality by using the fast ride quality calculation algorithm. The results show flexible damper can help control the flexural vibration of the flexible carbody and the higher the flexible carbody damping coefficient, the lower the first bending frequency of carbody need to be. Researches also show that the nearer the carbody damper installation position is to the center of carbody, the better effects it will achieve. In this article's example, when the coefficient of flexible damper reaches to $N \cdot s/m$, the required lowest bending frequency will drop to 6.5Hz , which can still achieve good ride quality under 200km/h operational speed.

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