

论文

矿车—轨道垂向耦合振动建模与仿真

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摘要:

将矿车简化为七自由度质量—弹簧—阻尼系统, 将矿井轨道等效为铺设于连续黏弹性基础上的欧拉梁, 利用赫兹非线性弹性接触模型模拟轮轨作用力, 从而建立了矿车与轨道组成的垂向耦合振动模型。仿真分析表明: 车体垂直振动及点头振动加速度的频谱峰值与轮轨作用力的频谱峰值吻合, 所以轮轨作用力是车体振动的激励源, 而且矿车运行速度越高, 轮轨作用力及车体振动幅值越大。金属橡胶具有良好的振动控制特性, 可以有效控制轮轨作用力及车体振动加速度, 有利于促进剧烈振动的矿车车体迅速恢复到平衡位置, 从而确保矿车平稳运行。

关键词: 矿车; 耦合振动; 轨道; 道床

Modeling and simulation of vertical coupling vibration of tramcar railway

Abstract:

Tramcar was regarded as seven degrees of freedom mass spring damping system.Mine railway was equivalent to Euler beam based on continuous and visco elasticity ballast.And, Hertz nonlinear elastic contact model was used for simulating the contact force between wheels of tramcar and tracks.A vertical coupling vibration model of tramcar railway was established.In frequency field, peaks of the vertical and nodding vibration accelerations of tramcar body agree with the peaks of wheel track force.So, wheel track force is the excitement source of tramcar vibration.And, the amplitudes of the wheel track force and vibration accelerations increase with the increasing of the speed of tramcar.Metal rubber has good vibration control characteristic.Simulation shows that it is useful to control the wheel track force and the vibration accelerations of tramcar body.Metal rubber can also promote the vibrant tramcar body to its equilibrium state quickly, so tramcar can run smoothly.

Keywords: tramcar; coupled vibration; rail; ballast

收稿日期 2011-11-15 修回日期 2012-04-12 网络版发布日期 2012-09-03

DOI:

基金项目:

国家自然科学基金资助项目(51105302); 陕西省教育厅专项科研计划资助项目(11JK0897)

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