

机械工程

足尺路面加速加载控制系统及试验研究

管志光^{1,2},林明星^{1*},王旭光²,张吉卫²

1. 山东大学机械工程学院, 山东 济南 250061; 2. 山东交通学院工程机械系, 山东 济南 250023

摘要:

自行研制了足尺路面加速加载试验设备,介绍了控制系统的硬件组成并进行了路面实验。控制系统采用CAN总线技术,通过变频器矢量控制方法实现路面加速加载设备的单方向循环式加载,利用该设备能够短时间内产生车辙和疲劳破坏,为道路设计、生命周期内的破坏机理研究、施工及验收以及新技术,新材料的应用提供了可靠的实验数据。通过路面加速加载实验,研究车辆荷载、行驶速度和轮胎胎压对路面结构的应变关系。结果表明:在行车荷载作用下,沥青面层底部动应变响应呈拉压应变交变状态;当胎压、荷载和速度发生变化时,沥青面层底部拉应变较压应变变化大,但随着速度的提高,变化趋势逐渐变小。

关键词: 足尺 路面加速加载 CAN总线 荷载 应变

Research on control system and test of full-scale highway accelerated loading testing

GUAN Zhi-guang^{1,2}, LIN Ming-xing^{1*}, WANG Xu-guang², ZHANG Ji-wei²

1. School of Mechanical Engineering, Shandong University, Jinan 250061, China;
2. Department of Mechanical Engineering, Shandong Jiaotong University, Jinan 250023, China

Abstract:

The facility of the full-scale highway accelerated loading testing(ALT) was developed, which has self-owned intellectual property. The control system was studied and designed for the full-scale ALT facility, and the pavement experiment was analyzed. The ALT control system adopted CAN bus, which can improve reliability. The circulating-type and single direction loading can be realized by vector control of the inverter. The tested pavement can produce rutting and mild fatigue in a compressed time period, which can help analysis the failure mechanism of the life cycle and can also offer reference for the road design, construction and acceptance. The relationship of dynamic pavement response with load, speed and tire pressure was researched using the facility. The results showed that there was not only tensile strain but also compressive strain at the bottom of the asphalt layer; furthermore, the variation of tensile strain was bigger than compressive strain, while the change trend reduced with the speed increasing.

Keywords: full-scale highway accelerated loading testing(ALT) CAN bus load strain

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通讯作者: 林明星(1966-),男,山东栖霞人,教授,博士生导师,主要研究方向为机械系统智能控制与动态检测技术.
E-mail: mxlin2000@163.com

作者简介: 管志光(1980-),男,山东单县人,博士研究生,主要研究方向为机电系统检测、诊断与控制.
E-mail: gzgwp@163.com

作者Email: mxlin2000@163.com

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