



考虑桩-土-锤相互影响的基桩瞬态动力响应

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TRANSIENT DYNAMIC RESPONSE OF PILE FOUNDATION CONSIDERING THE EFFECT OF PILE-SOIL-HAMMER

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摘要

考虑桩-土-锤的相互作用, 采用瞬态波特征函数展开法, 研究端承桩或嵌岩桩在打桩过程中的瞬态动力响应和次撞击现象。该文基于一维杆波动理论, 根据系统的初边值条件, 分别给出了打桩过程桩-土-锤结构的瞬态响应解和分离过程基桩的瞬态响应解。根据合理的撞击与分离过程转换条件, 实现对次撞击问题的分析。通过算例, 给出了基桩系统在打桩过程和分离过程的频率变化; 考虑撞击激发的高频响应, 分析不同模式截断项对结构响应的影响; 研究了瞬态应力波的传播特性和次撞击现象。研究结果可为基桩设计以及基桩长期运营的安全评估提供参考。

关键词: [固体力学](#) [瞬态响应](#) [波动理论](#) [基桩](#) [应力波](#)

Abstract:

The transient wave eigenfunction method has been proposed to solve the problem of the transient dynamic response of a pile foundation with the consideration of a pile-soil-hammer interaction. Based on one-dimensional wave theory and initial-boundary conditions, analytical solutions of transient responses during impact and separation processes were obtained, respectively. The conditions of the processes that occurred alternatively were established to research on the sub-impact phenomenon. The frequencies of a pile in a numerical example were investigated during the impact process and separation process. Considering the high-frequency response excited by impact, a proper wave truncation number was suggested to choose for transient dynamic responses. Meanwhile, the propagation of transient stress waves along the pile and time history of an impact force including sub-impact process has been analyzed. The present study can provide a reference method for the pile foundation design, the selection of a hammer and the safety assessment of a system in long-term operation.

Key words: [solid mechanics](#) [transient response](#) [wave theory](#) [pile](#) [stress wave](#)

收稿日期: 2011-05-03;

PACS: [O347.4](#) | [TU473](#)

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引用本文:

田阿利, 尹晓春. 考虑桩-土-锤相互影响的基桩瞬态动力响应[J]. 工程力学, 2012, 29(11): 283-288.

TIAN A-li, YIN Xiao-chun. TRANSIENT DYNAMIC RESPONSE OF PILE FOUNDATION CONSIDERING THE EFFECT OF PILE-SOIL-HAMMER[J]. Engineering Mechanics, 2012, 29(11): 283-288.

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