

激光与光电子技术应用

铝材管道管壁厚度对激光超声信号影响的探究

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摘要: 为了探究管壁厚度对超声信号的产生与探测的影响, 采用有限元法建立了理想化的管道模型, 分别探究均匀管壁厚度变化和激发源处、接收端处及传播路径上等畸变管壁厚度的变化对超声信号产生的影响。结果表明, 当接收端处管壁厚度较薄时, 无法探测到可分辨的瑞利波信号; 传播路径上管壁厚度变小到一定程度后, 高频成分会出现明显的衰减, 但随着厚度的增大又会在一定程度内恢复。这一结果对激光超声在柱状、管状材料的无损检测中的进一步应用提供了有益的补充。

关键词: 激光技术 激光超声 有限元法 无损检测

Effect of wall thickness of aluminum pipes on laser-induced ultrasonic waves

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Abstract: In order to explore effect of wall thickness on the generation and detection of ultrasound signal, several idealized eccentric pipe models were established based on the finite element method. Effect of different uniform wall-thickness and thickness change at the excitation source, detection point and the propagation path on ultrasonic signal was analyzed. The simulation results show that: when the wall is thinner, the Rayleigh waves cannot be detected; the wall thickness on the propagation path becomes small to some extent, the filtering effect will be so obvious that the high-frequency component is filtered out, but will resume within a certain extent in the pipes with thicker wall. This work will provide a useful guidance for the further application of laser ultrasonic in cylinder nondestructive testing field.

Keywords: laser technique laser ultrasonic finite element method nondestructive testing

收稿日期 2013-03-18 修回日期 2013-06-05 网络版发布日期 2014-01-06

DOI: 10.7510/jgjs.issn.1001-3806.2014.02.024

基金项目:

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