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热能工程

周期性管阵列的声传播特性实验研究

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摘要：

研究周期性管排阵列的声传播特性对于检测发生在炉内换热器管阵列中的泄漏故障具有重要意义。该文阐述了周期性管排阵列声传播物理机制。实验研究了周期性管排阵列的声传播特性。得出管阵列的纵向节距、横向节距和管径大小等几何参数对泄漏声辐射透射声谱的影响规律，揭示管阵列纵向节距影响透射声谱的“阻带”位置，横向节距影响透射声谱主极大的位置，以及管径大小影响透射声谱总能量的基本关系。指出充水管阵列与管内为空气的管阵列声透射特性的相同与差异，以及“通带”的位置。为炉内管阵列中的管道泄漏检测技术提供了实验依据。

关键词： 泄漏检测 管排阵列 声透射系数 阻带 通带

Experimental Study on the Propagation Characteristics of Sound Wave Through Periodic Tube Arrays

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Abstract:

It is important for detection of leakages faults in the boiler heat-exchanger tube array that the transmission characteristics of sound emission in the periodic tube arrays were studied. In this paper, the physical mechanism of sound transmission through any row within the periodic tube array was described. By experimentally studying on the sound propagation characteristics in the periodic tube array, the relationships between geometric parameters of the tube array and the transmission coefficients of leakage sound emission had been obtained. It was revealed that the longitudinal period of tube array would change the stop band frequencies, the transverse period of tube array would change the main maximum frequencies, and the diameter size of the tube would change the sound transmission energy. The sound transmission characteristics of water-filled tube array had been experimentally studied. The same and differences of sound transmission characteristics between water-filled tube array and air-filled tube array were given out, and the pass band frequencies were obtained. This paper provides an experimental basis for the tube leak detection technology in boilers.

Keywords: leak detection tube array sound transmission coefficients stop band pass band

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