

热能工程

炉管泄漏口喷流噪声的辐射特性

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摘要: 研究了管道泄漏喷流的流动特征及其噪声产生的物理机制, 指出泄漏喷流的混合区域是产生噪声的主要区域, 湍流射流的速度扰动是产生辐射声能量的根本原因。根据泄漏声辐射的声功率和频谱, 分析给出了泄漏喷流噪声的峰值频率与喷流速度和喷口直径, 以及辐射声功率与喷流速度之间的关系。对泄漏声辐射的频谱规律和指向性特征进行了实验研究, 得出管道泄漏口径大小、管内气体压力(喷流速度)等参数与喷流噪声辐射的频谱分布、声压级大小和指向性等声学参量之间的关系, 为炉内管道泄漏声检测技术的进一步发展提供了实验数据和声学依据。

关键词: 炉管 泄漏喷流 声辐射 频谱规律 指向性特征

Acoustic Radiation Characteristics of Jet Noise From a Boiler-tube Leakage Hole

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Abstract: The flow performance of the boiler-tube leak jet and their physical mechanism of the noise generation were studied, which revealed that the mixing region of the leak jet is the major area of the noise generation, and the speed disturbance of the turbulent jet is the principal factor influencing noise radiation. According to the power spectrum of the leak noise, dependence property of noise peak frequency on jet velocity and nozzle diameter, and sound power on jet velocity was concluded respectively. The spectrum and directivity of the jet noise were studied experimentally, and relationship between the parameters of the geometry, flow (such as the leak-hole diameter, gas pressure inside tube and jet flow velocity) and the parameters of the acoustics (such as the spectrum distribution, the sound pressure level and the directivity characteristics of the jet noise) was obtained. The result is useful to the development of the acoustic detection technology for the boiler tube leakage.

Keywords: boiler tube leakage jet flow acoustic radiation spectrum rule directional characteristics

收稿日期 2009-12-04 修回日期 2010-07-21 网络版发布日期 2010-10-22

DOI:

基金项目:

国家自然科学基金资助项目(10774043, 10974053); 声场声信息国家重点实验室开放课题研究基金(200903)。

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