

流体力学与传递现象

旋风分离器内旋转流的不稳定性

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摘要 采用二维热线风速仪(HWA)测量了 $\Phi 300\text{mm}$ 旋风分离器内瞬时切向速度随时间的变化,主要考察旋转流的不稳定性。测量结果表明在旋风分离器的中心区域,瞬时切向速度随时间波动变化较大,而靠近边壁区域,瞬时切向速度随时间波动起伏的变化较小。通过对瞬时切向速度进行频谱分析,中心区域的主频约44Hz,而边壁区域的主频不明显,中心区域瞬时切向速度的脉动幅值远大于壁面区域的脉动幅值。瞬时切向速度的变化反映了旋风分离器内旋转流的不稳定性,这种不稳定性导致了旋风分离器内旋转流的旋转中心与几何中心不重合,旋转中心围绕着几何中心摆动,由此造成了瞬时切向速度随时间的类周期的波动变化。

关键词

[旋风分离器](#) [旋转流](#) [不稳定性](#) [热线风速仪](#)

分类号

Instability of swirling flow in cyclone

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Abstract

The instability characteristics of swirling flow in the cyclone were studied based on measured real tangential velocity by hot wire anemometry (HWA). The results showed that the real tangential velocity fluctuated obviously in the center region of the cyclone, however, near the wall of the cyclone, the real tangential velocity had a little fluctuation. The real tangential velocity was analyzed with Fast Fourier Transform (FFT). There was a basic frequency near the center region of the cyclone, which was about 44 Hz. And the amplitude in the center region was bigger than that near the wall. The real tangential velocity fluctuation indicated that there existed an instability of swirling flow in the cyclone. This instability resulted in the rotation center of the swirling flow deviating from the geometric center of the cyclone, which produced the quasi-periodic oscillation of swirling flow and gave the real tangential velocity fluctuation.

Key words

[cyclone](#) [swirling flow](#) [instability](#) [hot wire anemometry](#)

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