

多相流和计算流体力学

水平管煤粉密相气力输送堵塞临界状态

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摘要

以煤粉为实验介质, 在输送管内径为10、15、20 mm条件下分别研究了以空气和CO₂为载气时的密相气力输送堵塞临界状态。通过逐渐降低输送气量调整输送流态, 获得了不同阶段的固气比、输送速度及压力信号等特征信息, 并对不同阶段的压力信号特征信息进行分析, 提取了不同阶段的特征参数, 采用功率谱对压力信号频域特征进行剖析, 获得了不同流动阶段的特征频率。研究表明, 堵塞临界速度与输送管道内径和载气性质有关, 依据实验数据, 建立了堵塞临界速度的量纲1经验方程;接近堵塞临界状态时, 管道内压力波动性显著, 波动频率向低频转化, 对压力信号进行计算, 得出了判定输送发生堵塞的判据式。

关键词

[堵塞临界速度](#) [密相](#) [气力输送](#) [载气](#) [管径](#)

分类号

Blockage critical state of pulverized coal dense-phase pneumatic conveying in horizontal pipe

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Abstract

Taking pulverized coal and dry air or CO₂ as the experimental materials, the blockage critical state of pulverized coal dense-phase pneumatic conveying with pipelines of 10 mm, 15 mm and 20 mm (ID) were studied respectively. The blockage critical characteristics, such as solids gas ratio, transporting velocity, pressure signal were obtained through reducing gas flow rate. Characteristic parameters and characteristic frequency of different stages were obtained by analysis of pressure signal characteristics and power spectrum analysis. The results showed that the blockage critical velocity was related to pipeline diameter and carrying gas characteristics. A dimensionless equation describing the relationship between blockage critical velocity and aforementioned parameters was finally established. Fluctuation of pressure signal was significant and vibration frequency converted to low frequency near blockage critical state. The criterion for blockage was obtained by mathematical calculation of pressure signal.

Key words

[blockage critical velocity](#) [dense-phase](#) [pneumatic conveying](#) [carrying gas](#) [pipeline diameter](#)

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