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多相流和计算流体力学

下行气固两相流与管内壁间的摩擦压降

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摘要

在较宽的操作条件范围内系统测试了下行床床层压力降，获得气固两相流与管内壁间的摩擦压降，提出了下行气固两相流与管壁间摩擦压降的计算模型。结果表明，在下行床的充分发展段，气固两相流与管壁间的摩擦导致表观颗粒浓度显著小于真实颗粒浓度；当表观气速大于8 m·s^{-1}时，气固两相流与管壁间的摩擦压降接近甚至超过气固两相流重力产生的静压降。在采用压差法测试下行床中的平均颗粒浓度时，如忽略气固两相流与管壁间的摩擦，则可能导致显著的偏差。下行气固两相流与管内壁间的摩擦压降主要来自于颗粒与管壁间的摩擦。颗粒直径对气固两相流与管壁间摩擦压降的影响随着操作气速的提高逐渐减弱。采用提出的摩擦压降模型对表观颗粒浓度进行修正后，预测值与实验值吻合较好。

关键词

循环流化床 下行管 摩擦压降 充分发展段 气固两相流

分类号

Friction between gas-solid suspension and CFB downer wall

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Abstract

To investigate the friction between gas-solid suspension and the internal wall of the circulating fluidized bed（CFB） downer，the difference between apparent and actual solids holdup was studied by measuring pressure gradients and local solids concentrations in a 9.3 m high CFB downer with FCC particles.A new model to predict pressure drop due to friction between gas-solid suspension and internal wall in the fully developed region of CFB downers was developed.The results showed that the friction between gas-solid suspension and the downer internal wall caused a significant deviation of the apparent solids holdups from the actual ones，especially under higher superficial gas velocity and solids circulation rate.When superficial gas velocity was greater than 8 m·s^{-1}，the actual solids holdups in the fully developed region of the downer could be up to 2—3 times of the apparent values.After the frictional pressure drop was considered，the predicted actual solids holdups by the proposed model agreed well with the experimental values from this work and in the literatures.

Key words

circulating fluidized bed downer friction fully developed section gas-solid two-phase flow

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