

传递现象

壁面粗糙度对通道流动特性的影响

邹江, 彭晓峰, 颜维谋

清华大学热能工程系, 相变与界面传递现象实验室; 华梵大学机电工程系

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摘要

从管道壁面附近的流动结构着手, 指出摩阻偏差系数不仅取决于相对粗糙度, 还取决于粗糙元疏密度、流动再附长度等具体几何、水力特征, 粗糙度对流阻的影响能否忽略不能单纯以相对粗糙度是否小于5%为标准。采用流道收缩效应的处理方法, 理论地分析这些特征对偏差系数的影响, 揭示出偏差系数随粗糙元密度与 Re 的增加而增加, 粗糙元分布很疏或者 Re 很小时粗糙度的影响可以忽略的规律。

关键词

[粗糙度](#) [摩擦阻力](#) [阻力偏差](#) [流动结构](#)

分类号

Effects of roughness on fluid flow behavior in ducts

ZOU Jiang, PENG Xiaofeng, YAN Weimou

Abstract

A theoretical analysis was conducted to explore the flow structure adjacent to rough walls and its influence on flow friction. The flow friction resistance coefficient was found not only dependent on the relative roughness, but also the geometrical and hydrodynamical features, such as roughness elements density and flow reattachment length. It was irrational that the effects of roughness on the coefficient could be neglected with the criterion of the relative roughness being below 5%. The equivalent treatment of flow area constriction was made, and modified formula and resistance deviation coefficient η were introduced to correct the reduction value of the duct diameter as the function of relative roughness ε/d , roughness element density parameter A and Reynolds number Re . The resistance deviation coefficient increased with increasing A and Re , and the effects of roughness could be ignored at very sparse roughness element distribution or at low Re .

Key words [roughness](#) [friction resistance](#) [resistance deviation](#) [flow behavior](#)

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通讯作者 彭晓峰 pxf-dte@mail.tsinghua.edu.cn

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