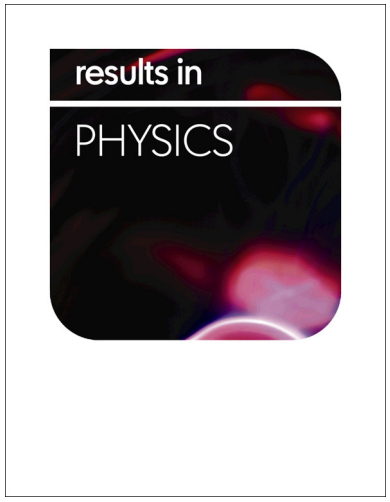

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The contact heat transfer between the heating plate and granular materials in rotary heat exchanger under overloaded condition

Luanfang DUAN, Chonggang QI, Xiang LING*, Hao PENG*

(Jiangsu Key Laboratory of Process Enhancement and New Energy Equipment Technology, School of Mechanical and Power Engineering, Nanjing Tech University, No. 30 Pu Zhu South Road, Nanjing 211816, PR China)

Abstract

In the present work, the contact heat transfer between the granular materials and heating plates inside plate rotary heat exchanger (PRHE) was investigated. The heat transfer coefficient is dominated by the contact heat transfer coefficient at hot wall surface of the heating plates and the heat penetration inside the solid bed. A plot scale PRHE with a diameter of D_o=273mm and a length of L=1000mm has been established. Quartz sand with d_p =2mm was employed as the experimental material. The operational parameters were in the range of ω=1~8rpm, and F=15, 20, 25, 30%, and the effect of these parameters on the time-average contact heat transfer coefficient was analyzed. The time-average contact heat transfer coefficient increases with the increase of rotary speed, but decreases with the increase of the filling degree. The measured data of time-average heat transfer coefficients were compared with theoretical calculations from Schlünder's model, a good agreement between the measurements and the model could be achieved, especially at a lower rotary speed and filling degree level. The maximum deviation between the calculated data and the experimental data is approximate 10%.

***Key Words*:** rotary heat exchanger; contact heat transfer; granular material; heating plate; overloaded

1. Introduction

Granular materials are of substantial importance in a variety of industrial processes, such as grain, food products, fertilizer, cosmetics, metallurgy, coal, electronics and other fields. According to the statistics, the processing of granular materials consumes an estimated 10% of the planet's energy

* Corresponding authors Tel: 86-25-83587570 Fax: 86-25-83600956
Email address: xling@njtech.edu.cn (X. Ling)
Email address: hpeng@njtech.edu.cn (H. Peng)
Email address: l.f.duan@139.com (L Duan)
Email address: mondboom@126.com (C. Qi)