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Experimental and CFD study of particle deposition on the outer surface of vortex finder of a cyclone separator

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Abstract: Based on the industrial background of carbonaceous deposition in secondary cyclone separators of FCC units, this paper focuses on particle deposition pattern and investigation of factors on deposition on the outer surface of vortex finder of secondary cyclone. Particle deposition experiments were carried out with a 500mm-diameter cyclone in a cold-model pilot test platform. Deposition patterns were obtained under different inlet gas velocities, particle concentrations and experimental materials etc. Furthermore, discrete phase model (DPM) was applied to obtain particles distribution in the annular space and the effect of particle properties and operational conditions on mass of deposited particles was also investigated. In addition, Gas shielding method was preliminarily explored to avoid particle deposition. The results will provide experimental evidence for analyzing the deposition process and help to further understand the deposition mechanism.

Keywords: deposition, cyclone separator, vortex finder, FCC, DPM

1. Introduction

Unwanted build-up of carbonaceous deposits on equipment surfaces has been a key process limitation to achieving longer run length, which has occurred in fluid catalytic cracking (FCC) units ^[1-7], fluid coker ^[8-11] and steam crackers for ethylene production ^[12-15]. The build-up of

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