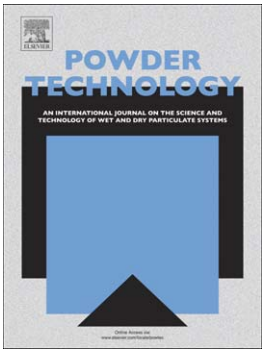

Experimental and numerical study of particle deposition on perforated plates in a hybrid electrostatic filter precipitator

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PII: S0032-5910(17)30665-4
DOI: doi:10.1016/j.powtec.2017.08.021
Reference: PTEC 12760

To appear in: *Powder Technology*

Received date: 19 May 2017
Revised date: 27 July 2017
Accepted date: 6 August 2017

Please cite this article as: Gongming Tu, Qiang Song, Qiang Yao, Experimental and numerical study of particle deposition on perforated plates in a hybrid electrostatic filter precipitator, *Powder Technology* (2017), doi:10.1016/j.powtec.2017.08.021

Experimental and numerical study of particle deposition on perforated plates in a hybrid electrostatic filter precipitator

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Abstract

The advanced hybrid particulate collector (AHPC) is a highly promising and novel hybrid electrostatic filter technology that removes particles from flue gas. Perforated plates are used as collecting electrodes to attain better synergism between the electrostatic and bag zones. A laboratory-scale AHPC was built to investigate the dust collection performance of perforated plates with different percentages of open area (POA) and opening types. Particles were deposited on the front, flank, and back sides of the plate. Differences in cake packing density were observed at different locations. With the increase in POA, the collection efficiency of the front side decreases, whereas the collection efficiencies of the flank and back sides increase. The increase in the collection of the flank and back sides compensates for the decrease in the collection of the front side, which only changes slightly the total efficiency with the POA. The opening type exhibits minimal effect on total efficiency. A numerical method was established to simulate the dust collection process in the electrostatic zone. Simulation results indicate that the openings change the electric field near the plate and facilitate particle deposition on the flank and back sides, which result in the characteristics of collection efficiency. The difference in the cake structure results from the distribution of electric field strength on the plate surface.

Keywords: Particle; AHPC; Electric field; Perforated plate; Deposition