

NUMERICAL AND EXPERIMENTAL STUDY OF PARTICLE DEPOSITION IN A TANGENTIAL INLET CYCLONE SEPARATOR

Yaodong Wei, China University of Petroleum, Beijing China
weiyd@cup.edu.cn

Jianfei Song, Ti Yue, State Key Laboratory of Heavy Oil Processing, China University of Petroleum; Beijing
Key Laboratory of Process Fluid Filtration and Separation, China

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Fluid catalytic cracking (FCC) is an industrial process which converts high-molecular-weight hydrocarbons to lower-molecular-weight products of high value. With the rise of a much heavier fraction in feed, unwanted buildup of carbonaceous deposits onto the surface of the process equipment has been a key process limitation to achieving the economic benefits of longer run length.

Hard deposits tend to appear on the outer surface of vortex finder of the secondary cyclones in FCC unit. Literatures have reported that deposits formation is related to the gas flow field. In this study, gas phase flow field in a tangential inlet cyclone was simulated by Large Eddy Simulation, and its effect on deposits buildup was studied by analyzing the forces and secondary flow near the vortex finder wall. The simulated results showed the relationship between flow field and deposits formation. Meanwhile, particle deposition experiment system is setup to investigate the influence of velocity, particle concentration, surface adhesion and length of time on the deposits pattern. Among these experiments, oil-brushed vortex finder wall was studied to imitate an industrial condition in FCC approximately. The experiments offered a more comprehensive study about particle deposition in cyclones.

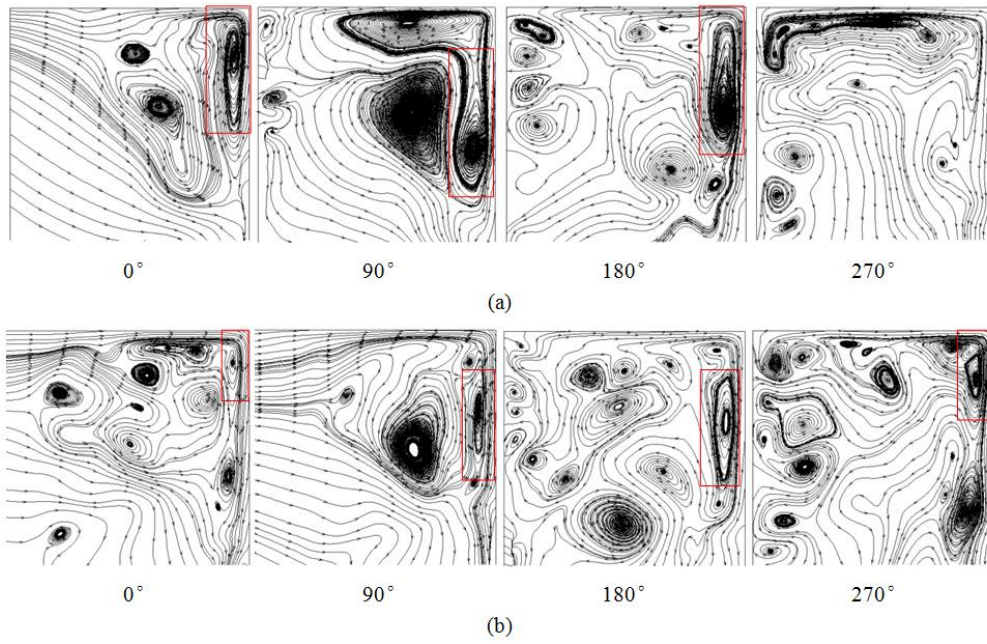


Fig. 1. The secondary vortexes in circular section of annular space of: (a) tangential inlet cyclone, (b) volute inlet cyclone

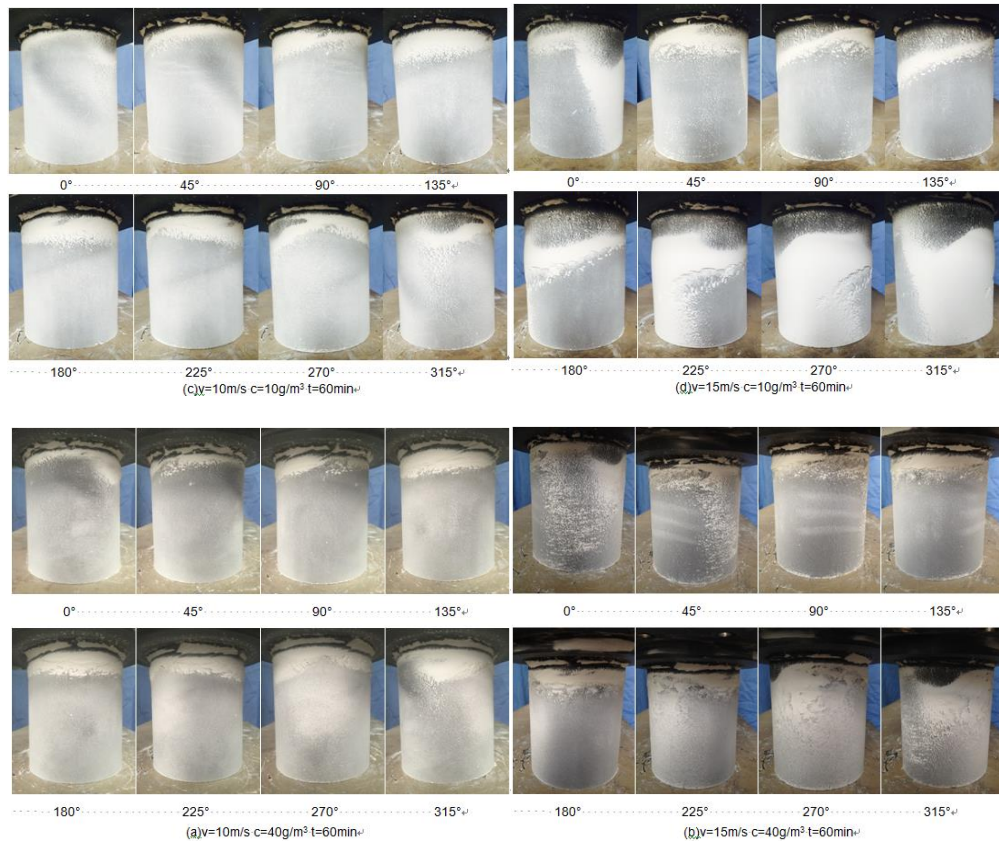


Fig. 2. Deposition patterns of vortex finder with different inlet velocities and particle concentrations (particle-laden gas flows from right to left)