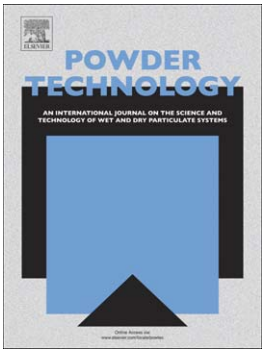

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The Effect of Cross-shaped Vortex Finder on the Performance of Cyclone Separator

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Abstract: This paper presents a numerical study on a traditional Lapple cyclone separator with the inserted cross-shaped metal blades in the vortex finder. The Reynolds stress model (RSM) is used to simulate the gas flow, and the Lagrangian particle tracking model (LPT) is used to simulate the particle flow. The model is validated by good agreement between the numerical results and experimental data and then is used to simulate cyclones with inserted blades of different dimensions in the vortex finder. The results show that the vortex finder with cross-shaped blades could decrease the pressure drop significantly by 16.41% while improve the separation efficiency slightly by 0.64%. Facilitated by the simulations, the effect of the inserted blades on the flow field in the vortex finder is analyzed, which helps elucidate the mechanisms of the flow field in the vortex finder on the improved performance. It is found that the pressure drop in the vortex finder is generally decreased by the reduction of the vortex core diameter. The variation of the pressure in the vortex finder could change the pressure of the whole cyclone body. The turbulence intensity in the vortex finder and inner vortex has little influence on the separation efficiency, and the