Countercurrent Flow Simulation of Gas-Solid System in a Purge Column Using Computational Fluid Dynamics Techniques

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Abstract : Purge columns or degasser vessels are widely used in the polyolefin process for removing trapped hydrocarbons and in-excess catalyst residues from the polymer particles. A uniform distribution of purged gases coupled with a plug-flow characteristic inside the column system is desirable to obtain optimum desorption characteristics of trapped hydrocarbon and catalyst residues. Computational Fluid Dynamics (CFD) approach is a promising tool for design optimization of these vessels. The success of this approach is profoundly dependent on the solution strategy and the choice of geometrical layout at the vessel outlet. Filling the column with solids and initially solving for the solids flow minimized numerical diffusion substantially. Adopting a cylindrical configuration at the vessel outlet resulted in less numerical instability and resembled the hydrodynamics flow of solids in the hopper segment reasonably well.