

Industrial Case Studies of Multiphase CFD Simulations Applied to Fluidized Bed Reactors

김지훈*, Peter Blaser¹, Sam Clark¹, 서광원, Scott Thibault¹
(주)경원테크 연구소; ¹CPFD Software
(kjh@kw-tech.co.kr*)

Designing Fluidized Bed Reactors (FBRs) can be very challenging because this process is difficult to model computationally using traditional Navier–Stokes CFD methods. The Multi-Phase Particle–In–Cell (MP–PIC) method combines a Lagrangian formulation for the solid phase with an Eulerian formulation for the fluid phase and offers substantial benefits for modeling FBR applications. The computational method is briefly discussed but is more fully described in the referenced works.

The use of the MP–PIC method for modeling several FBRs is described. The cases include a laboratory–scale silane deposition reactor, a full–scale fluidized–bed coal gasifier, a fluid catalytic cracking (FCC) regenerator, and a full–scale CFB loop using 100% biomass fuel. The objectives and modeling approach for each case are described as is the agreement with laboratory data or field test experience, where applicable. Both the FCC regenerator and the CFB loop were studied to address serious internal erosion issues and the use of the simulations to address these erosion concerns is described in detail, including the agreement of results with damage found by inspection in the field.