

Multifluid CFD modeling of circulating fluidized beds

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Progress in modeling and simulation of flow processes in gas/particle systems carried out at the authors' research group are presented. Emphasis is given to computational fluid dynamics (CFD) models that use the multi-dimensional multi fluid techniques. Turbulence modeling strategies for gas/particle flows based on the kinetic theory for granular flows are given. Sub models for the interfacial transfer processes and chemical kinetics modeling are presented. Examples are shown for several gas/particle systems including flow in risers (Figure 1 and 2) and reacting systems (Figure 3).

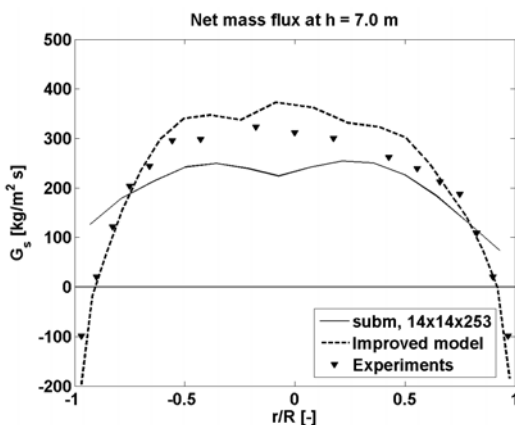


Figure 1: Comparisons of measured and simulated mass flux for the improved model and the original submitted case 7 m above the inlet. (Hansen et al., 2003)

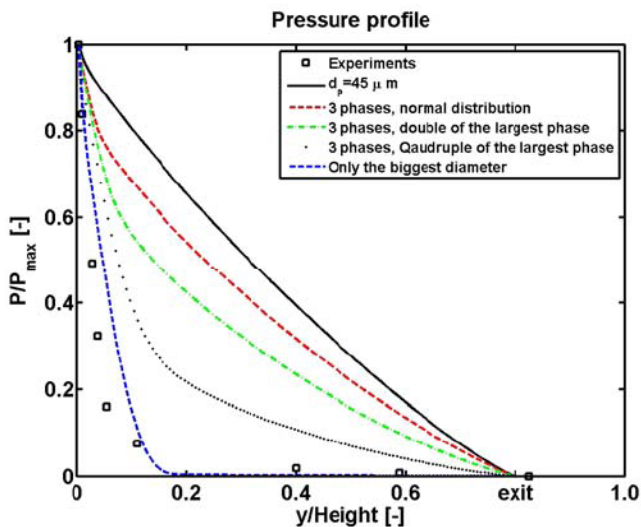


Figure 2: Comparison of simulated and measured pressure profile.. (Hansen et al., 2007)

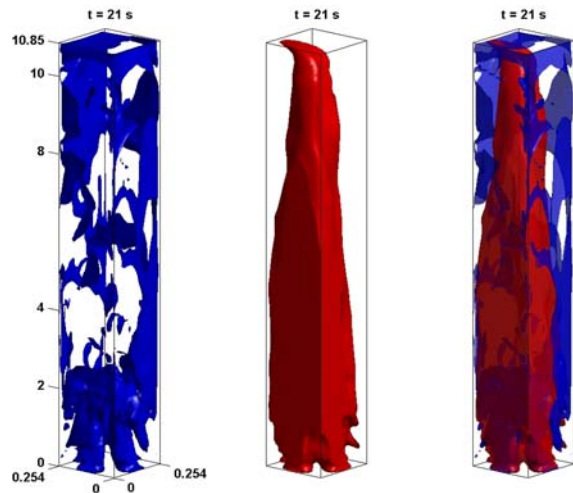


Figure 3: Isosurfaces at $t = 21$ s. From left to right: iso-surface of a volume fraction of 3.5%; isosurface of a dimensionless ozone concentration of 0.6; Combination of the two first plots. (Hansen et al., 2004)

References

- Hansen, K.G., Ibsen, C.H., Solberg, T., Hjertager, B.H. (2003). Eulerian/Eulerian CFD Simulation of a Cold Flowing FCC Riser. *Int J of Chemical Reactor Engineering*, 1 A.31.
- Hansen, K.G., Solberg, T., Hjertager, B.H. (2004). A three-dimensional simulation of gas/particle flow and ozone decomposition in the riser of a circulating fluidized bed. *Chem.Eng.Sci*, Vol 59, 5217-5224.
- Hansen, K.G., Solberg, T., Hjertager, B.H. (2007), A computational study of the distribution of particles in a lab-scale CFB boiler. Presented at: The 12th International Conference on Fluidization - New Horizons in Fluidization Engineering. May 13-17, 2007, Harrison Hot Springs, BC, Canada.