Process retrofit of a bench-scale transport gasifier using CFD simulation

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Hydrodynamic behaviors of gas-solid flow are investigated in a bench-scale transport gasifier (BSTG) for coal gasification by means of computational fluid dynamics (CFD) simulation. A multiphase Eulerian-Eulerian (E-E) model incorporating the kinetic theory of the granular flow is applied to a three-dimensional CFD modeling to understand hydrodynamics of the two-phase flow and to predict the pressure profile, and the solid circulation rate.
The design of the bended section connecting the riser and the cyclone as well as the design of the L-valve should be carefully rechecked, because they could cause unstable fluctuation of the gas-solid flow and pressure fluctuation inside the BSTG. It is suggested that a rectangular form between the riser and cyclone would be more suitable and an inclination (or slope) of L-vale connection tube would be more than 30°.