Numerical Simulation of Tube Erosion in a Bubbling Fluidized Bed with a Dense Tube Bundle

Abstract:
Tube erosion in a bubbling fluidized bed is numerically studied using the Eulerian-Eulerian method coupled with a monolayer kinetic energy dissipation model. The hydrodynamical simulations are performed under conditions with three different superficial gas velocities. The time-averaged bubble frequency and bubble rise velocity are calculated to characterize the bed hydrodynamics. The erosion rates of two target tubes are simulated and the influence of the bubble behaviors on erosion rates is evaluated. Compared with the experimental data in the literature, the bubble behaviors are well captured by the simulations. Good agreement between the calculated and measured erosion rates is also obtained for the two target tubes. The bubble behaviors around the tubes have direct impact on the tube erosion. Only small discrepancies in the calculated erosion rates are found when using different particle-wall restitution coefficients and specularity coefficients.