

Characteristic Velocities of Mixture of Sand and Sawdust in a Fluidized Bed

박동규, 김상돈*

KAIST

(kimsd@kaist.ac.kr*)

Biomass is known as an important renewable alternative energy resource. Sawdust was chosen as a biomass which is suitable for domestic power plants application. By itself, sawdust does not fluidize well and it exhibits channeling with the Geldart C powder behavior. Therefore, sand particles were added as an inert component to improve fluidization quality of sawdust. The characteristic velocities of the initial fluidization velocity (U_{fi}), the minimum fluidization velocity (U_{mf}), and the complete fluidization velocity (U_{fc}) of the mixture of sand and sawdust were determined in a fluidized bed. U_{mf} of the mixture increases exponentially up to 14 cm/s ($2.5U_{mf}$) with increasing weight fraction of sawdust. The values of U_{fi} and U_{fc} exhibit similar trends with the variation of U_{mf} . The existing correlations to predict U_{mf} of the binary mixtures can not be used successfully due to the peculiar fluidizing behavior of sawdust. To predict U_{mf} of sawdust, a new correlation as a function of Reynolds and Archimedes numbers was developed. The segregation between the two components starts at the gas velocity between U_{fi} and U_{fc} . Beyond U_{fc} (17 cm/s), the well-mixed state of the mixture of sawdust and sand can be attained in the whole bed.