

EVALUATING THE IMPACT OF FEED LOCATION ON THE BUBBLING FLUIDIZED BED GASIFICATION OF BIOMASS

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For fluidized bed gasifiers of biomass the selection of feeding location has been identified as a significant factor in determining gasifier performance, including carbon conversion, gas efficiency, and tar concentration in the producer gas. Over-bed feeding is a simpler arrangement where the biomass feed falls onto the surface of the fluidized bed from above. This can cause elutriation of fines without ever making contact with the bed, limiting carbon conversion or increasing tar loading in the gas. On the other hand, in-bed feeding inserts the biomass feedstock beneath the surface of the bed meaning that all the biomass particles, regardless of size, must contact the fluidized bed. In-bed feeding systems are generally more complex since the feed system must seal against the hydrostatic pressure of the bed and there may be issues with heat conduction or hot sand erosion of feed system components. This work reviews published experimental comparisons between over-bed and in-bed feeding locations, including analysis of impact of the different feeding strategies on mixing and fluidized bed hydrodynamics. The findings from the review are compared against experimental results from a pilot scale (200-250 kg/h biomass feed rate) gasification of two woody feedstocks each from an in-bed and an over-bed feed position. At similar equivalence ratios, the bed temperature was decreased with in-bed feeding relative to the over bed feeding. Although in-bed feeding appeared to have improved carbon conversion to gas, the tar concentration in the producer gas was not decreased with in-bed feeding relative to over-bed feeding.