

COMPUTER-AIDED SIMULATION OF A FLUIDIZED-BED REACTOR FOR THE PRODUCTION OF BIOFUELS FROM RICEHUSK BIOMASS

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ABSTRACT

This research work focused on the simulation of a Fluidized-Bed Reactor for the production of biofuels from biomass (rice husk) using Advanced System Process Engineering Plus Simulation Software (ASPEN Plus software). The Aspen plus simulation was based on experimental set up and findings for rice husk gasification from literature. Major conversion rates for Reaction Kinetics in a gasifier reactor were obtained from literature. The Simulation model was validated with experimental data from a pilot scale gasification plant obtained from literature as well. During the simulation hydrodynamic parameters were calculated. Results obtained showed reasonable agreement with experimental data with a maximum deviation of 20.6%. The effect of air-fuel ratio and steam-fuel ratio together with temperature on product gas composition was studied. Optimal operation points to achieve self-sufficient conditions for energy was at the temperature of 800⁰C, while air-fuel ratio and steam-fuel ratio was at 0.02 and 1.77 respectively. The maximum carbon conversion efficiency achieved was 71.1%.

Keywords: Gasification, Aspen Plus, Fluidized-bed reactors, Biofuels, Syn gas, Rice husk.