ABSTRACT

Gasification of rice husks in a bubbling fluidized bed gasifier using air as the sole gasifying agent was investigated. The study was conducted in four stages: a) Fluidized bed hydrodynamic study in a bubbling bed cold model to investigate the minimum fluidize velocity, pressure drop across the bed etc, b) study of the design methodology of a bubbling fluidized bed gasifier, c) development of mathematical models to predict the performance of the fluidized bed gasification system and d) experimentation to investigate the effects of various operating variables on the performance of the gasifier .

Two models were devolved for air and steam gasification. The models were capable of predicting the steady state performance of a fluidized bed gasifier at a wide range of operating conditions. The models were based on the homogeneous equilibrium theory, material and energy balances. The three equilibrium reactions (water-gas shift, methanation and oxidation reactions) were used in the model. The result obtained at various operating condition is compared with experimental result available from other researchers and it was found quit satisfactory.

Gasification experiments were carried out in a bubbling bed gasifier with reactor height of 4000 mm, bed diameter of 500 mm and a freeboard diameter of 700 mm. Experiments were performed in the range of equivalent ratios of 0.17 to 0.32. The equivalent ratio 0.24 to 0.26 is appeared to be the optimum conditions with respect to the quality of gas. The mole fractions of the combustible components basically H_2 reached the maximum values at these conditions. The higher heating value of the gas obtained at these equivalence ratio (3.2-5.0 MJ/Nm^3) compared very well with published data from air-blown biomass gasifiers of similar scale of operation.