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EFFECT OF STATIC BED HEIGHT ON THE COMBUSTION OF RICE HUSK IN A FLUIDIZED BED COMBUSTOR

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ABSTRACT

The combustion process is largely controlled by temperature, turbulence and residence time. When the temperature is sufficiently high so that the reaction is no longer kinetically-controlled, turbulence and residence time play a significant role. The reaction is thus diffusion-controlled. During the combustion of rice husk in a fluidized bed, the turbulence is largely governed by the mixing behavior in the inert sand bed, which in turn is governed by the bubble formation characteristics. Further, the residence time among the reactants (air and rice husk) and the heat source is also dependent on the turbulence in the bed. When all other parameters are held constant, the bubble phenomena vary according to the expanded bed height corresponding to a given static bed height. For high heat and mass transfer rates, small slowly rising bubbles are desired. Thus, the purpose of this study is to investigate the effect of static bed height on the quality of ash during the combustion of rice husk. The degree of rice husk burning in the bed could be deduced from the bed temperature as a higher bed temperature indicated that a higher portion of the rice husk feed is being burnt in the bed. Moreover, the particle size of the resulting ash is also able to give indication of the degree of rice husk burning in the bed as the turbulence arising from the bubbling action of the bed material is known to break down the char skeleton of the rice husk, thereby, resulting in ash with finer size. From this study, the static bed height of 0.5 D_c was found to give the lowest residual carbon content in the ash (1.9 wt%) and the highest bed temperature (670°C) among the other range of static bed heights investigated.

Keywords: fluidized bed, rice husk, static bed height, bubble eruption, ash