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Abstract

The purpose of this thesis is to study the effects of bed-stirring on downdraft gasification of rice husk. Experiments were carried out for a 40 cm*80 cm cylindrical gasifier to determine the thermal characteristics of the gasification process, and the thermal properties of the resulting gas, at different stirring speeds and equivalent ratios(ϕ).

The results of fixed-bed(no stirring) experiments show that the highest heat content in the gas was obtained at $\phi = 0.25$ for the range of ϕ tested($\phi = 0.19-0.56$), with 19.0 % CO and 1.6 % CH₄. The highest temperature recorded in the oxidation zone is 802 °C, with a steep temperature gradient in the radial direction, indicating high rate of heat loss.

When ϕ was fixed at 0.25 and stirring speed of varied from 1, 2, 4 to 8 rpm, it was found that gas of 8.14 % higher heat content was obtained for stirring speeds of 1 and 2 rpm, and that spatial temperature distributions in the bed are more uniform than the case of fixed-bed conditions.

However as stirring speed increases, the heat content in the gas decreases, with the temperature distribution tending to be more uniform while the temperature in the oxidation zone drops. The optimum stirring speed thus appear to be between 1-2 rpm.