Pretreatment of Rice Husk using Hot Water Washing for Ash Removal

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Abstract

Biomass from agricultural waste is renewable source of energy to use in boilers and furnaces. Rice husk which is abundant in Sri Lanka is a potential source of biomass, but ash content containing alkali and alkali earth metals and silicates create operational and corrosion problems. This study investigates the effect of temperature (40, 50, 65, and 75 ^{0}C) and particle size (1.0-1.4, 1.4-2.8, and 2.8-5.6 mm) of rice husk by 2 hours of water washing. Conductivity of leachate was measured at regular intervals to identify the leaching behaviour of ash with time. The removal of ash was compared against unwashed sample. Compositions of K_2O, Fe_2O_3, CaO, MgO, SiO_2, Al_2O_3, TiO_2 and P_2O_5 of ash were determined after combusting the treated and untreated rice husk to understand the leaching behaviour of ash constituents and to calculate the fouling indices. A linear positive relationship was obtained between percentage removal of ash *vs* temperature for all particle sizes. The effect of particle size is more significant compared to temperature; as particle size reduces, more ash is removed even at lower temperatures. Maximum of 25.2 %(w/w) of ash was removed by washing 1.0-1.4 mm particle size at 75 ^{0}C. Up to 90 % of K, 70 % of P and over 40 % of Fe, Al and Ti had been removed; however, the source of water has an effect on some constituents (increase in Ca and Mg). Overall improvement in fouling index can be achieved by increasing temperature and/or reducing particle size.

Keywords: Rice husk, ash removal, hot water washing