

Enhancing the energy properties of fuel pellets from oil palm fronds of agricultural residues by mixing with glycerin

Abstract

Nowadays, the main largest energy resource is coal followed by oil and natural gas. This phenomenon raises the public concerns to diversify the energy sources to sustain energy availability. To address these predicaments, biomass from agricultural residue is an important source for renewable energy. Oil palm frond is one of the abundant agricultural residues available from the oil palm plantation area in Malaysia. Processing the oil palm fronds into fuel pellets are seen as an attractive option, which is expected to reduce the amount of agricultural residue in the plantation area. In this study, 3 portions of oil palm fronds which are bottom, middle and top have been divided and 2 different particle sizes which are 0.5 and 1.5 mm were used combination with glycerin, a by-product from biodiesel production to determine their influences on the energy properties of fuel pellets. The glycerin was combined with oil palm fronds as a biomass binder to enhance the energy properties with the optimum ratio of ingredients (ratio of raw material and glycerin) for producing fuel pellets. Proximate properties (moisture content, volatile matter, ash content and fixed carbon) and energy content (calorific value) were conducted as the parameters to determine the energy properties of the fuel pellets. The glycerin content ranging from 15 to 45% (by weight), enhanced the calorific value of the oil palm fronds' fuel pellets from 16.73 to 22.72 MJ/kg. The results from the proximate and energy content analyses met the fuel pellet standard requirement according to the Pellet Fuel Institute (PFI). The highest of 22.72 MJ/kg heating value of fuel pellet were achieved from the middle portion of 1.5 mm particle size with the mixture ratio was 55:45; oil palm frond and glycerin respectively. In the result, the combination of oil palm fronds and glycerin can be used as an alternative material for biomass energy sources. © 2006-2016 Asian Research Publishing Network (ARPN).