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# Evaluation of energy and mechanical properties of bio briquettes produced using mix waste paper, industrial food processing waste and sawdust bio char.

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Nowadays the greatest problem arising for the world population is the huge demand for energy. Due to the sharp increase in population and industrial demands, energy sources are depleting rapidly. So there is a demand for alternative energy sources in the world. Due to the increase in population and the industrial activities, large amounts of waste are produced,most of whichis dumped in dumpsites, causing severe environmental problems. Biodegradable waste, paper waste and wooden wastes collectively contribute up to about 70% of the total MSW generated in Sri Lanka.

In this study paper waste, saw dust which is converted to charcoal and industrial food sludge were used as raw materials for the production of briquettes. Paper waste was shredded and pulped, saw dust and industrial food sludge were ground and sieved and all the raw materials were mixed thoroughly and used for briquetting. Then using the briquetting machine (manual) three different types of briquettes were produced and they are produced using saw dust bio char, paper, and industrial food processing waste in 42.5:42.5:15, 35:50:15, and 50:35:15 ratios, respectively.They were labelled SPF1, SPF2, and SPF3, respectively. The energy properties including moisture content, volatile matter content, ash content, and calorific value were determined and fixed carbon content was calculated. Mechanical properties including bulk density, compressed density, relaxed density, durability, water resistance capacity and water boiling time were measured and fuel wood value indices (FVI) of briquettes were calculated. When briquette types SPF1, SPF2 and SPF3 are considered, where an equal amount of industrial food processing waste was added as a raw material for briquetting, type SPF2 and SPF3 have lower moisture contents. Type SPF3 shows promising energy properties having the highest volatile matter content (68%), lowest ash content (3.8%), lowest fixed carbon content (28.53%), highest calorific value (14.38) and highest FVI (2297.44) when compared to other SPF1 and SPF2 briquette types. Though, SPF3 has comparatively poor mechanical properties including low durability (95.78%), low density and low water resistance capacity (99.39%), those values are within the acceptable range of a good source of biomass fuel. Therefore, comparatively briquette type SPF3 (saw dust bio char 50%, mix paper 35% and 15% of industrial food processing waste) is more suitable as an energy source for food processing industries to convert their own waste to energy. Different industries have different energy requirements. To fulfill those requirements different types fuels with different properties are needed. There are different types of briquettes and by using One-way Anova the properties of the briquettes were analyzed.

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