DE LA SALLE UNIVERSITY

A B S T R A C T

FUEL CHARACTERISTICS OF BRIQUETTES FROM WASTE COFFEE PULP AND HULLS

Waste coffee pulp and hulls are by-products of coffee bean processing from the berries. Although classified as agricultural wastes, they are believed to contain energy that can be recovered. This study deals with their possible conversion into solid fuel forms that could be handled better than the loose form. It also deals with the evaluation of their fuel characteristics in this densified form.

Briquetting using a binder was proposed as the method for their densification into solid fuels. The qualities that best describe a fuel such as the proximate composition, gross heating value, ash weight and form, smoke composition, combustion temperature and rate of burning were the factors considered in designing the experiments.

Thus, the experimental part of the study involved two major steps; namely, briquetting and the evaluation of the fuel characteristics of the briquettes. The briquettes were made from coffee pulp and hulls using starch paste as binder in a minimum concentration of 7.7 %.

In the investigation of the fuel characteristics of

the briquettes, it was found out that the waste coffee pulp-hull mixture has the average proximate composition of 17.15 % moisture, 60.29 % volatile combustible matter, 17.78 % fixed carbon and 4.99 % ash. The briquettes contain 15.39% moisture, 60.22 % volatile combustible matter, 19.41 % fixed carbon and 4.98 % ash. The results of the ultimate analysis showed that the coffee wastes contain 0.36 % nitrogen, 4.8 % ash and 0.12 % sulfur.

The gross heating value, as determined by the bomb calorimeter method, is 3835 kcalories per kilogram, while the smoke composition by Orsat analysis showed 2.22% carbon dioxide, 7.27% oxygen, and 0.60 % carbon monoxide. During self-sustained combustion the core temperature of the briquettes tested ranged from 280 C to 290 C for a 2 x 4 briquette and 450 C to 475 C for a 4 x 4 briquette. The rate of burning was investigated using the TGA method and the results showed that the rate of weight loss is greatest during the decomposition of hemicellulose and of cellulose. The order of combustion follow the sequence hemicellulose > cellulose > lignin.

Tests done on the crushing strength of the briquettes showed they can withstand normal handling.

The fuel characteristics exhibited by the coffee pulp and hulls show that they can qualify as a fuel source.

The conversion of the waste coffee pulp and hulls into briquettes may be a reasonable step to recycle and recover their available energy. The briquettes may likewise provide the fuel needs for mechanical coffee drying and for domestic consumption.