Efficient Utilization of Waste Biomass and Waste Paper for the Production of Ecofriendly Fuel

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***Abstract*: With the increase in urbanization and industrialization, coal, a non renewable source of energy is getting exhausted day by day. Moreover the fossil fuels produce much of green house gases which are the main sources of health problems. The objective of this work is to deal with this major problem of today's scenario and to find solution to replace the non renewable source with a renewable and more potential form of energy like biomass briquettes. Biomass briquettes were made with different percentage of paper paste and equal mixture by mass of green waste like rice husk (RH), Straw of pulses (SP), sugarcane bagasse (SB) and saw dust (SD). Percentage volatile matter and ash content was determined and their calorific value was also evaluated. It was found that the calorific value increased with increase in the percentage of paper paste. Moreover the percentage of ash content decreased with increase in paper waste. Such biomass briquettes can be created domestically. Therefore, constantly rising fuel prices will be less significant in an economy if sources of fuel can be easily produced domestically.**

***Keywords:* Biomass briquettes, proximate analysis, paper paste, ecofriendly fuel**

I. INTRODUCTION

The most imperative factor in the development of any country is energy. The unrestrained consumption of fossil fuel has made a huge gap between demand and supply of energy. This gap can be filled by substituting the solid fossil fuel with renewable and greener biomass waste briquettes. It is available in various type of raw material available easily in bulk. For developing country like India where there is huge availability of agro-forestry waste such initiatives will be a boon for the people. By this we can even generate revenue from agro-forestry waste thus leading to the production of an ecofriendly renewable green energy.

Briquettes can be made by either piston press which give a solid cylindrical form of briquettes or by screw press in which a hole is there in the centre of briquettes. According to [1] researchers the screw press form is more efficient as fuel as it increases surface area of log and assists efficient combustion. Much work has been carried out in making biomass briquettes using agricultural, industrial, municipal waste etc.

India holds second position in the production of sugarcane. For each tonne of sugarcane crushed, about 300 kg of bagasse is reclaimed. On the other hand India produces 200 million tonnes of paddy and each tonne of paddy gives 300 kg of rice husk, likewise India is the largest producer and consumer of pulses. Out of million tonnes of agricultural waste produced only half of it is used as fodder. Saw dust in another waste obtained in bulk during the cutting of woods. These raw materials are already used in making briquettes [2 – 7] and binders have also been used during compression [8 and 9]. Tonnes of waste paper which has been recycled five to six times are generated everyday. Disposal of these solid waste is becoming a nuisance to our environment. In the present work these four materials together were mixed with different amount of paper waste to procure briquettes having high calorific value. Thus, this will not only be an answer to their disposal problems but also will help to enhance the heating capacity of ecofriendly fuel.

II. MATERIALS AND METHOD

Rice husk (RH), straw of pulses (SP), saw dust (SD) and sugarcane bagasse (SB) was procured from respective mills. These were dried in hot air oven at 110 ^{o}C for one hour then they were introduced in ball mills in equal proportions by weight. The powdered material so obtained was sieved into two different sizes and was labeled as 0.08 mm and 0.15 mm. Waste paper (WP) was soaked for two weeks in water. This was mashed in mixer and its homogenous paste was obtained. This was then mixed with each sieve in three different proportions of 10%, 20% and 30%. Mixture was homogenized and introduced to screw press type briquette making machine and then again dried. There are inherent binders in the biomass which will come to the surface at a particular temperature and pressure and will bind the material together. Percentage volatile matter and ash content of all the eight types of briquettes was carried out and their calorific value was examined.

III. RESULTS AND DISCUSSIONS

The volatile content evaluated for different briquettes shows a decrease in volatile matter with the decrease in the size of particles which shows that smaller the sieve size more will be the compactness of briquettes and lesser will be the volatile matter released while combustion thus giving rise to proper combustion. It was also seen that the increase in the percentage of WP also decreases the volatile matter content. The percentage of ash also decreases with the decrease in the sieve size and increase in the percentage of WP in briquettes. This shows that small sieve size homogenizes the combustion

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at all sites and presence of WP enhances this quality as WP has lesser ash content than the other contents used in briquettes. Moreover, calorific value calculated shows an increase in the heat capacity of briquettes with the increase in the percentage of WP which proves that WP is the correct substitute if used with the mixture used to prepare briquettes.

Table 1: Percentage of Volatile Matter and Ash present and calorific value of various briquettes

Sample	Sieve Size	Ratio of RH:SP:SB:SD:WP	% Volatile Matter	% Ash	calorific value (kcal/kg)
1.	0.15mm	25:25:25:25:00	47.2	16.22	3700
2.	0.08mm	25:25:25:25:00	45.4	16.00	3858
3.	0.15mm	22.5:22.5:22.5:22.5:10	44.5	14.85	3940
4.	0.08mm	22.5:22.5:22.5:22.5:10	42.8	14.50	4100
5.	0.15mm	20:20:20:20:20	43.0	13.44	4199
6.	0.08mm	20:20:20:20:20	41.7	13.00	4374
7.	0.15mm	17.5:17.5:17.5:17.5:30	37.5	11.68	4598
8.	0.08mm	17.5:17.5:17.5:17.5:30	36.0	11.05	4700

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