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Experimental Investigation and Analysis on Biomass Briquettes

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Abstract

This paper highlights the problems associated with the dependence on wood as the main source of fuel for households and industries in rural and semi-urban areas. It also discusses the measures to promote the production, marketing and use of briquettes from coal and biomass materials as alternative energy, as well as their advantages. Man's expanding need for energy has become almost synonymous to the growth and developments in the modern science and technology propelled agro-industrial society. It is however quite clear that increased energy consumption has resulted into serious problems such as global warming and erratic climate.

***Keyword* — Briquette saw dust, cow dung biomass, producer gas, binding material, combustion, thermal efficiency, calorific value.**

1. INTRODUCTION

Biomass briquettes, mostly made of green waste and other organic materials, are commonly used for electricity generation, heat, and cooking fuel. These compressed compounds contain various organic materials, including rice changes currently being experienced around the world. So diminish this problem we will use biomass briquettes as energy producer. Biomass is the plant-derived organic material of all forms that can be used for energy production: wood plant matter, crop or forest residues, animal dung etc.

It then concludes that to curb deforestation for the purpose of fuel wood collection and their negative impacts on health, climate and ecology: affordable and environmentally friendly fuel sources for homes and local industries are vital cow dung is used for briquetting.

Husk, bagasse,ground nut shells, municipal solid waste, agricultural waste, or anything that contains high nitrogen content. The composition of the briquettes varies by area due to the availability of raw materials. The raw materials are gathered and compressed into briquette in order to burn longer and make transportation of the goods easier. These briquettes are very different from charcoal because they do not have large concentrations of carbonaceous substances and added materials. Compared to fossil fuels, the briquettes produce low net total greenhouse gas emissions because the materials used are already a part of the carbon cycle.

2. BIOMASS BRIQUETTING

Biomass Briquettes are a viable and low cost alternative to environmentally damaging fuels such as firewood, kerosene and charcoal. They are similar in appearance to regular charcoal but they are made out of charcoal waste, agricultural residues or sawdust, which are normally considered unusable waste.

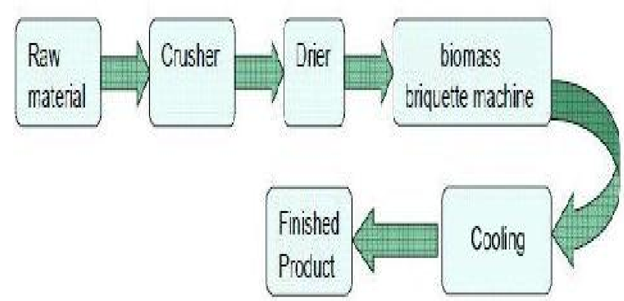

Fig.1 Process of making Biomass Briquettes

The case for promoting a widespread use of briquettes is a strong one: the current use of charcoal and firewood is contributing to wide- scale deforestation in many developing countries. The cost of charcoal is also increasing.

Sources of biomass

1. **Industrial waste-** Sawdust
2. **Agro Waste -** Mustard waste, Rice husk, Arhar stalks, Groundnut Shell, Pine needles Sarkanda,

Bagasse. Coffee husk, Cotton Stalks, Sunflower & waste, Sugarcane bagasse, leaves & trash, maize stalks, bajra cobs.

Fig.2 Industrial Waste Sawdust

3. GENERAL INFORMATION ABOUT BIOMASS

Biomass material, including sawdust, rice husks, peanut shells, coconut fibers and palm fruit fibers, was densified into briquettes at modest pressures of 5–7 MPa using a piston and die type of press. The briquettes were tested to evaluate their relaxation behavior, mechanical strength and burning characteristics. The sawdust briquettes were found to have better overall handling characteristics. But briquettes of different biomass materials required different optimum conditions of fabrication and generally showed a promising potential for further development.

3.1 Application

Briquetted fuel can be used by the industrial, commercial and household sectors. It is ideally suited for use in the following areas:

3.1.1 Boilers
Sugar mills, paper mills, chemical plants, Cement, food processing units, oil extraction units etc. Using fuel for steam generation and heating.

3.1.2 Forges and Foundries
For metal heating and melting.

3.1.3 Brick kilns and Ceramic Units
For firing of furnaces, residential heating, for winter heating in cold areas and in restaurants, canteens etc.

3.1.4 Gasification:
The gas can be used to generate power, and eventually replace coal based producer gas systems and oil firing in furnaces.

3.1.5 Agriculture:
Heating Green houses, Nurseries and Chicken coops.

4. EXPERIMENTAL SETUP

1. Collects biomass materials such as Sawdust, cow dung, subabul etc.
2. Mix these all biomass material in different ratios.
3. Prepare pallets sample with the help of palletize machine.
4. Dried these all types of pallets sample in sun light.
5. Calculate the calorific value of pallets sample by using bomb calorific meter.
6. Compare the calorific values of Biomass Briquettes with their separate component of biomass material using ash percentages.

Fig.3 Bomb Calorimeter

Fig.4 Pressure Measuring Device

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Fig.5 Tabulate Maker Machine

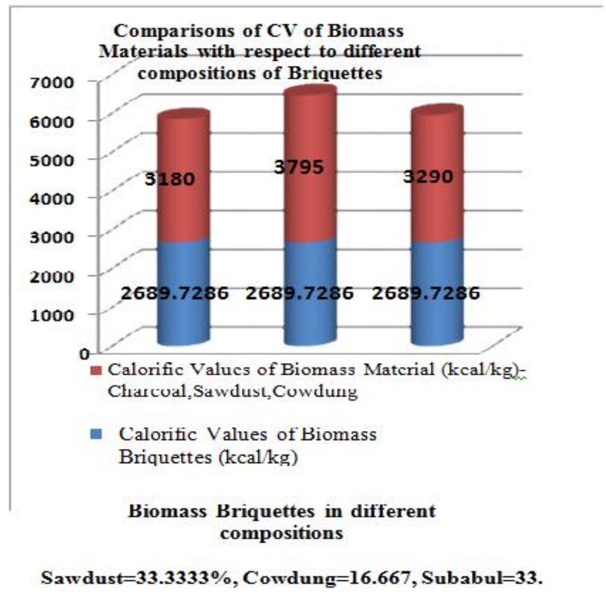
Fig.6 A Picture of Sample

Fig.7 Biomass Briquettes

5. RESULT AND DISCUSSION

In this chapter we discuss about variation of calorific values of biomass briquettes with their respective compositions:

Calorific Value - One of the most important characteristics of a fuel is its calorific value, that is the amount of energy per kg it gives off when burnt. The calorific value can thus be used to calculate the competitiveness of a processed fuel in a given market situation. There is a range of other factors, such as ease of handling, burning characteristics etc., which also influence the market value, but calorific value is probably the most important factor and should be recognized when selecting the raw material input.



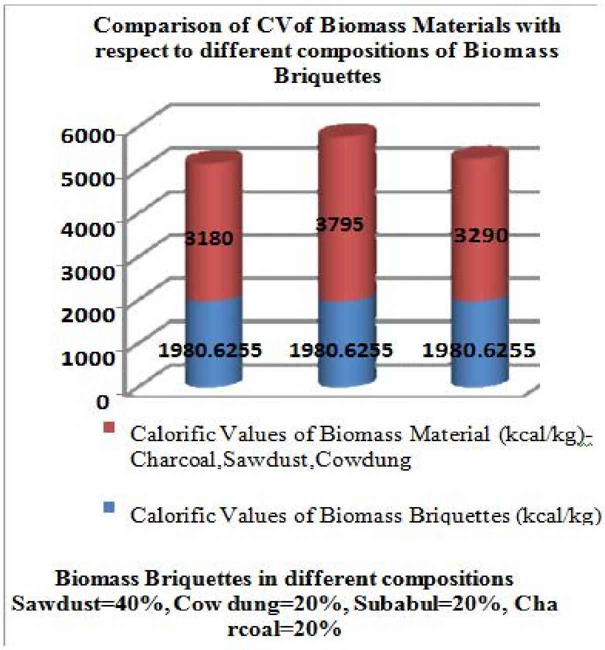
Graph 1

This bar graph 1 shows the variation of calorific values of biomass material with respect to different composition of biomass briquettes. In this graph calorific values of original biomass materials have more calorific values than different composition of biomass briquettes.

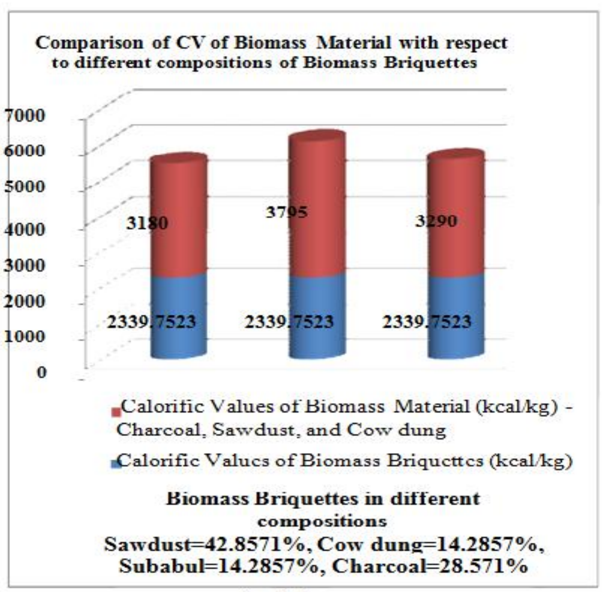
Graph 1 shows the calorific value of sawdust is 3795 kcal/kg which is higher than the calorific value of cow dung which is 3290 kcal/kg and calorific value of charcoal which is 3180 kcal/kg and more higher than the calorific value of biomass briquette of sawdust- 33.3333%, cow dung-16.667%, subabul-33.3333%, and charcoal-16.667% which is 2689.7286 kcal/kg.

These bars graph 2 shows below, the variation of calorific values of biomass material with respect to different composition of biomass briquettes. In this graph calorific values of original biomass materials have more calorific values than different composition of biomass briquettes.

Graph shows 2 the calorific value of sawdust is 3795 kcal/kg which is higher than the calorific value of cow dung which is 3290 kcal/kg and calorific value of charcoal which is 3180 kcal/kg and more higher than the calorific value of biomass briquette of sawdust-40%, cow dung- 20%, subabul-20%, and charcoal-20% which is 1980.6255 kcal/kg.



Graph 2



Graph 3

This bar graph 3 shows the variation of calorific values of biomass material with respect to different composition of biomass briquettes. In this graph calorific values of original biomass materials have more calorific values than different composition of biomass briquettes.

Graph 3 shows the calorific value of sawdust is 3795 kcal/kg which is slightly higher than the calorific value of cow dung which is 3290 kcal/kg and calorific value of charcoal which is 3180 kcal/kg and more higher than the calorific value of biomass briquette of sawdust-42.857142%, cow dung-14.28571%, subabul-14.28571%, and charcoal-28.571% which is 2339.7523 kcal/kg.

Calculation of Calorific Value:

Water equivalent of Benzoic Acid= (6319*Weight of Benzoic Acid) +45/Rise in Temperature Weight of Benzoic Acid= 1.1541g
Initial Temperature of Benzoic Acid=33.1ºC
Final Temperature (Rise Temperature) of Benzoic Acid=2.95ºC
Water equivalent of Benzoic Acid = (6319*1.1541)+45/2.95=2487.37555

Gross Calorific Value of Coal" (GCV)

GCV= (Rise in Temperature* Water equivalent of Benzoic Acid)-45/Weight of Sample

6. CONCLUSION

1. The calorific value of sawdust is 3795 kcal/kg which is greater than the calorific value of cow dung, charcoal and biomass briquette which contain sawdust-33.3333%, cow dung- 16.667%, subabul-33.3333%, and charcoal-16.667%.
2. The calorific value of sawdust is 3795 kcal/kg. which is greater than the calorific value of cow dung, charcoal and biomass briquette which contain sawdust-40%, cow dung- 20%, subabul-20%, and charcoal-20%.
3. The calorific value of sawdust is 3795 kcal/kg which is greater than the calorific value of cow dung, charcoal and biomass briquette which contain sawdust-42.857142%, cow dung- 14.28571%, subabul-14.28571%, and charcoal-28.571%.
4. Research work also shows that the calorific value of biomass briquettes increases with increasing the percentage of charcoal and decreasing the percentage of sawdust' and vice versa.

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