FUEL BRIQUETTING ALTERNATIVE COOKING FUEL MADE FROM SOLID WASTE

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Abstract

Energy consumption in the rural sector of India, particularly is in the form of petroleum-based fuels, and now a days the utilization of these fuels has been increased rapidly .Such an increase in the fuel consumption will have a serious effect on all economic and domestic activity, particularly in the vast rural areas. As the usage of the fossil fuels have increased so much and it effects adversely on the health of every individual. Burning the fossil fuels such as wood, coal, kerosene gives off smoke and releases other harmful gases. In order to minimize theses effects an alternate cooking fuel is needed and one of the solutions is ***Fuel -Briquetting***.

Fuel Briquette can be made from any kind of organic waste, which is easily available the organic waste can be made into briquettes by mixing it with a thick solution of paper pulp. This mixture is then poured into a screw press to remove water and make them into solid pieces/briquettes. These briquettes can be dried and used as an alternative cooking fuel.

Briquettes to produce from banana peels and saw dust are also going to be used through their compaction ratios and also to get the value of utilized heat produced. The study focuses on the design of briquetting machine and development of briquettes produced from banana peels and

saw dust, as banana peel got high calorific value this has been used as one of the constituent in the fuel briquette produced. A production level type of briquetting machine is designed but low in cost is efficient and could be developed to transform agro-waste into fuel briquettes

Key Words : Fuel, Fossil fuels,BioMass,Fuel Briquette, Cooking Fuel Key Words : Fuel, Fossil fuels,BioMass,Fuel Briquette, Cooking Fuel

Introduction: Biomass Briquetting is the process of converting low bulk density agro waste into high density fuel. These are good replacements for conventional cooking fuels, economical and eco-friendly and utilize materials that constitute solid waste.

India is reaching out to fuel-starved rural/urban communities and individuals to transfer the simple skills for making fuel briquettes from agricultural, municipal, industrial and domestic waste to people in remote areas to meet their cooking fuel needs and for livelihood support from selling the briquettes. This project is a rare example of how simple, innovative technologies and techniques can offer remarkably effective solutions to critical, day-to-day problems of underprivileged people, while protecting the environment.

A manual Briquetting Machine, single person operated can produce about 5 to 6 to 8 Kg of briquettes per day/per shift. A family of 4 persons requires about 0.5 to 0.75 kg of briquettes daily to meet their cooking needs. A day's operation of briquetting machine can produce more than a week's fuel requirement easily. It also helps in Solid Waste Management by reducing the volume to be sent to land-fills, where it is presently burnt or buried without proper care.

Almost 70% of Afghans live below the poverty line of $30 a month, with very little economic stabilization programs in sight to reduce the effects of war and increase the purchasing power of Afghans and bring their life a sense of normality. With the briquette project, Afghans 4 Tomorrow.(A4T) aims to directly address the issue of poverty by providing a simple and sustainable business opportunity to the most disadvantaged populations of Afghanistan; one that will not only serve as an ongoing source of income to help people satisfy their basic needs, but also introduce & produce alternative environment friendly burning fuel to heat homes and cook food.

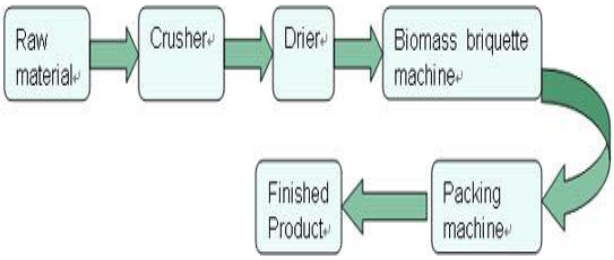
Materials used in the fuel briquette making : The fuel briquettes are made out of loose raw materials like rice husk, saw dust, coir pitch, groundnut-shell, coffee husk, sugar cane which are abundantly available, into a compressed form to increase its specific weight, thus increasing the fuel efficiency (Combustion Efficiency) as compared to its loose condition without using any Binders.

The materials that we are using are saw dust and rice husk with binding material (paper) . As they are mostly available in cities which can be properly used in making briquetts .

Fuel Briquettes are used to replace conventional fuels like coal , firewood in heating .

-Briquettes do not emit smoke with sulfur or phosphorus and also fly ash. Hence no need of pollution controls equipment.

Flowchart of the Biomass Briquetting Machine Technology



Stepwise Sequence of Production of Fuel Briquettes From Agricultural, Domestic & Industrial Waste Materials

- Shred waste paper into smaller pieces to be soaked overnight (should be soaked 36 to 48 hrs for best effect) in water. Please note that this paper should not contain any pins, paper clips etc

- Cut the grass, leaves and sugarcane bagasse in small pieces about one cm and dry in plastic buckets so as to protect this material from the wind.

- Soak the small pieces of grass, Leaves and sugarcane bagasse in water, overnight.

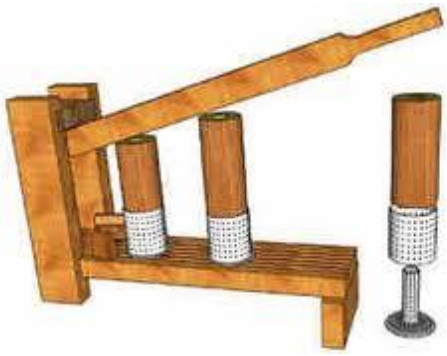
- Once soaked overnight, use this material to make pulp for briquettes. The pulp will be made

by using a special tool or wooden hammers.

- Weigh saw dust and remove all thick sticks. Spread a 4 inch thick layer of saw dust on a plastic sheet.
- Use a sufficient amount of water while stirring the pulp (material soaked all night and then made into pulp).
- Pour the pulp on the layer of saw dust. Cover the saw dust layer as if making a pizza with toppings.
- Mix the pulp and the saw dust well – either by walking on it with rubber boots or with your hands.
- Collect mixed saw dust and paper pulp in the center to make a pyramid. Cover the pyramid with paper pulp and walk on it.
- Be sure to mix the saw dust with the paper pulp well, this will form the base for briquettes.
- Put the mixture in drums or buckets, add water to the drum and stir and mix the pulpy solution well.
- Put this pulp into the press to make a briquette. Operate the press as shown to make briquettes.
- Dry the briquettes in the sun on a plastic sheet or on rods.

A sample fuel briquette

Fuel Briquetting Machine



Results

Calorific value of the briquettes:

After the briquettes are free undesirable moisture, it is analysed in a bomb calorimeter which gave the following result.

Parameters

I. Proximate analysis result

Moisture content 11.40%

Volatile matter(ARB) 54.85%

Ash content(ARB) 19.43%

Fixed carbon(ARB) 14.32%

II. Ultimate analysis(ARB)

1. Carbon 38.40%
2. Hydrogen 2.06%
3. Nitrogen 1.42%
4. Oxygen 27.23%
5. Sulphur 0.05%
6. Phosphorous 0.01%
7. Moisture content 11.40%
8. Ash content 19.43%

III. Gross calorific value (ARB) 3264 k.cal/kg

1.The design of the wooden fuel briquetting press is about 50X25X4 (length X breadth X depth) (all dimensions are in inches)

2. The material of the press is teak wood.

3. The assembly of the press is found satisfactory.

4. At a single stroke we can make 2 briquettes.

5. Less man power is required and is very easy to operate.

6. Design is validated.

7. Calorific value of the briquettes is 3264.cal/kg.

Conclusion

Fabrication of fuel briquetting machine has been done. Fabrication of the machine and producing Fuel Briquettes was the main criteria.
Producing alternative cooking fuel is very much needed and it is very effectively achieved with the present design.

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