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BRIQUETTING AN ALTERATE METHOD FOR RECYCLING AGRO WASTE

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ABSTRACT

Every year, millions of tons of agricultural wastes are generated which either destroyed or burnt inefficiently in loose form are causing air pollution. Moreover, agricultural wastes like stalks of different cereal and millet crops, shells, bags etc. Are difficult to be transported, stores and handled. They give low thermal efficiency when used in mud/traditional chulhas.

These wastes can be recycled and can provide a renewable source of energy by converting biomass waste into high density - fuel briquettes without addition of any binder. The process of converting agro waste into homogenous fuel is called Briquetting. Since they have standardized shape, it is easy to handle in loading, unloading, storing, transporting and using in end processes. This recycled fuel is beneficial for the environment as it conserves natural resources. At present more than 60% of the Briquetting plants are located in the states of Gujarat, Punjab and Tamil Nadu; about 30% plants are located in Uttar Pradesh, Maharashtra and Karnataka and rest in Madhya Pradesh and Andhra Pradesh.

KEYWORDS: Recycle, Agricultural Wastes, Pollution, Agro & Production

INTRODUCTION

Various raw materials that can be converted into briquettes are agricultural residue - leftover leaves, grasses, stem and straw from rice, husk, wheat husk, wheat straw, coffee husk, coconut husk, coconut shells, corn cobs, textile fibre waste, saw dust, charcoal dust, coir pith, jute sticks, bagasse, ground nut-shell, mustard stalks and cotton stalks, soya bean stalk, pigeon pea stalk, waste paper, water hyacinth etc., which can be dignified into briquettes at high temperature and pressure using different technologies.

Figure 1

The briquettes can be used for domestic purposes (cooking, heating, barbequing) and industrial purposes (agro-industries, food processing) in both rural and urban areas. Briquettes are used in various industries like Leather industry, Brick kiln, Solvent extraction oil mill, Textile, Dye and chemical industry, Tea factories, Rubber factories, Pharmaceutical

industries.

Figure 2

Briquetting of residues takes place with the application of pressure, heat and binding agent on the loose materials to produce the briquettes.

Briquettes made from the wastes generated in agriculture and allied sectors have several advantages over traditional fuels like coal, firewood and low density fuels:

Deforestation can be curtailed by reducing the consumption of fuel wood in log form.

Since the briquettes are in compact form, it is non-messy in handling, storing and transporting long distances without disintegrating.

Uniformity in size and quality in terms of burning rate can be attained.

Briquettes will be completely burned till the end, unlike fuel wood, twigs, coal or dung cakes which generate ash content. Thus the ash disposal problem in case of briquettes is solved.

Additional income can be generated by training the farmers in making briquettes and setting up of briquette making as an enterprise would create jobs for the unemployed youth.

Recycling of wastes into briquettes is cheaper than the conventional fuels as they cannot be replenished once used.

Heat intensity and burning efficiency are higher in briquettes.

One can make money from selling briquettes

The solid briquettes can be burnt up to 3-4 hrs. Whereas normal one only light up to 20 minutes at the max.

Disadvantages of Biomass Briquetting

Briquette making machines are expensive and they require electricity to run which increases maintenance cost too.

If Agro waste is not properly carbonized it may lead to the emission of smoke and less instability.

If non-carbonized briquettes are exposed to humid weather, they tend to absorb moisture.

Briquetting is the process of densification of biomass to produce homogeneous, uniformly sized solid pieces of high bulk density, which can be conveniently used as a fuel.

The Densification of the Biomass Can Be Achieved by any One of the Following Methods

- Pyrolysed densification using a binder,
- Direct densification of biomass using binders and
- Binder-less Briquetting.

Depending Upon the Type of Biomass, Three Processes are Generally Used in Making Briquettes

- When sawdust is used, it has to be sieved first, then dry it, and condense it. After cooling, it can be packed.
- For agro and mill residues like coffee husk, rice husk, ground shells, drying can be avoided. But they have to sieved, crushed to small pieces before compacting them.
- Sugar cane bagasse, coir pith, mustard, wheat, jowar stalks need to be dried first as they will be having some amount of moisture and then should be subjected to densification.

Cooling and packing of briquettes will be done finally in all the above three methods at the end after densification or compaction.

Production of a compact, solid briquette from agro residues is possible through ram/piston press and or screw press technology.

Based on operating conditions, it can be done by a) hot and high pressure densification and b) cold and low-pressure densification. Based on mode of operation, it is of two types i.e. Batch densification and continuous densification.

Piston press, screw press, rolls, press densification methods, palletizing and manual presses are dependent on the type of equipment used for making briquettes.

On the basis of compaction pressure, the briquettes can be made with high pressure, medium pressure with a heating device and low pressure with a binder.

Piston Press Densification

There are two types of piston press i.e. Die and punch technology, which is also known as ram and die technique; and hydraulic press. This method is mostly used in Europe and United States. In die and punch method, agro-waste is compressed with high pressure by using a mould to get standard sizes. 25 KW power is required to produce 700kg/hr with 60 mm diameter. It is the most cost-effective technology used in India. Piston blockage, wear and tear are the major problems faced with this method. Briquettes quality is little inferior as they have the tendency of being brittle.

Figure 3

The hydraulic press process consists of first compacting the biomass in the vertical direction and then again in the horizontal direction. The standard briquette weight is 5 kg and its dimensions are: 450 mm x 160 mm x 80 mm. The power required is 37 kW for 1800 kg/h of Briquetting. This technology can accept raw material with moisture content up to 22%. The hydraulic moves at a very slow pace i.e. 7 cycles per minute compared to die and punch which moves at 270 cycles per minute.

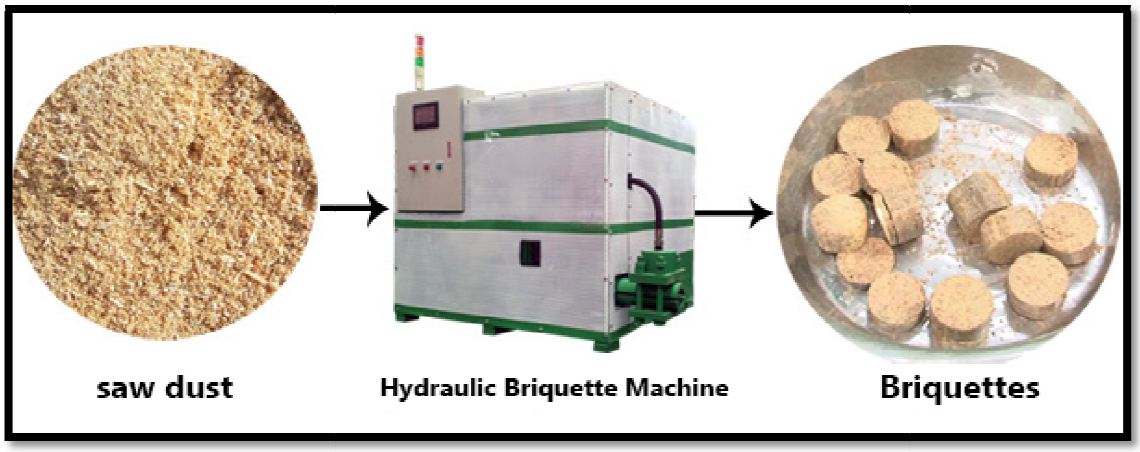

Figure 4

Screw Press

Screw press technology was invented by Japan, briquettes produced by this method are more superior in terms of storability and combustibility compared to the ram/piston pressed briquettes. Conical press and screw press with heated die equipment are used. Extrusion method is followed by high pressure, which incorporates a central hole in the briquettes. Thus, it helps to achieve uniform and efficient combustion and allows briquettes to be carbonized. It consumes 60kwh/tonne by accepting raw material with 8-9% moisture content. The density of the briquette made in this method is normally about 1-1.4 GM/cucm.

Figure 5: Screw Press

Roller Press

Charcoal briquettes are made by this method where agro waste is passed through two rollers which rotate in opposite directions. Usually briquettes are compacted into pillow-shape. Carbonized biomass like coconut shells, corn cobs are suitable to be converted into briquettes by this technique. However, they require some binder like soil or starch needs to be added.

Figure 6

Pelletizing

Pellets are small sized briquettes made by using a pelletizer. Pelletizer has a circular perforated disk with dies arranged as holes, in which two or more rollers rotate and press onto the inner perimeter. Flat/disk and ring type pellet presses are used for making briquettes. The power required to run these machines is 15-40 kwh/tone. Large capacity pelletizers consume the power in the range of 200kg/h to 30 tonnes/hr.

Figure 7

Manual Presses and Low Pressure Briquetting

Different types of manual presses are used for making briquettes from various agro-waste.

Manual clay brick making presses are used both for raw biomass feedstock or charcoal. The main advantages of low-pressure Briquetting are low capital costs, low operating costs and low levels of skill required to operate the technology. Low-pressure techniques are particularly suitable for Briquetting green plant waste such as coir or bagasse (sugar-cane residue). The wet material is shaped under low pressure in simple block presses or extrusion presses. The dried briquette has little mechanical strength and crumbles easily. The use of a binder is imperative. Binding agents used are soil, paper or starch.

The basic process of making briquettes is simple, although the details vary slightly according to what sort of rubbish is used. They can be made from non carbonized materials like waste paper, saw dust etc. Or from carbonized material like charcoal dust or carbonizing non-carbonized material like coconut shells.

Step 1: Sort out the materials you wish to put into the briquette: Agricultural residues and municipal processing waste

Step 2: Chop the material up and let the agricultural residues stand until partially decomposed

Step 3: Mix the material into a soupy slurry in water

Step 4: Squeeze the slurry inside a porous cylindrical mould to create hollow round cylinders or briquettes

Step 5: Dry the briquettes for a few days before use

Pulveriser

Mixer

Briquetting Machines

Briquettes

Briquetting Stove

Figure 8

The cost of Briquetting stove ranges from: Rs: 1,500- Rs: 25,000 depending on the features available. One tonne of briquettes cost ranges from: Rs: 3,700- RS: 20,000 depending on the type of organic waste used and method of manufacturing the briquettes.

Table 1: Calorific Value of Briquettes

S. No	Biomass fuels	Calorific values (Kcal/kg)
1	Paddy straw	3000
2	Rice husk	3040
3	Sawdust briquettes	3898
4	Groundnut	4200
5	Sugarcane and wheat straw	3800

Table 1: Contd.,		
6	Cotton stalks	4700
7	Maize stalks	3500
8	Soya bean husk	4170
9	Paper	3226

Source: www.lehrafuels.com

CONCLUSIONS

Thus, it can be concluded that briquettes are made out of any agro waste. They can be made with or without binders. Binder less briquetting requires heavy machinery, large space and high power consumption. Briquetting with a binder is more suitable for rural areas. The steps to be followed in any of these methods are collected of agrowaste, drying, crushing, compressing and cooling. Piston press and screw press technologies are used to manufacture commercial briquettes. Though screw press technology is more efficient, Piston press technology is more popular. Since raw material is available abundantly, Briquetting can be promoted as an enterprise to meet the demands both in industrial and household sectors.

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