

Briquettes making machine for industrial and agricultural purpose

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Abstract - In this paper Briquettes making machine is designed. Biomass briquettes generally made of agricultural waste and commonly used for electricity generation, cooking food and keeping warm. These compressed compounds contain various organic materials including rice husk, bagasse, groundnut shells, cotton stalks, husk of soya bean and agricultural waste, they are the less carbon emission. These agricultural wastes are brought together and press by rotating screw and form briquette in order to burn longer and transportation of goods easier. This biomass briquettes are different from coal it have much lower ash content than coal. We can also manufactured domicile animal food briquettes from agricultural waste material and we can preserved this briquettes for summer season. Because now a days there are shortage of domicile animal food and one another problem is that for shortage of this animal food we need large space or room. But by using briquettes making machine we can eliminate this problem and stored large amount of animal food in small space in the form of briquettes.

Key Words: Briquette, Briquette machine, agricultural waste, rural development.

1. INTRODUCTION

Briquettes are used as a alternative source of energy. Briquette made from waste material such as rice husk, bagasse, groundnut shells, cotton stalks and husk of soya bean and agricultural waste they are the less carbon emission. In India as well as foreign countries many of companies switched from fossil fuels to briquettes machine project to get ecofriendly bio fuel and also to save our environment from pollution and CO2 emission. The raw material combined and compressed into briquette in order to burn longer and makes the transportation of goods easier [1]. Briquettes are inexpensive than coal. There is no fly ash when burning briquettes and have high burning efficiency. It is renewable energy source that make better our surroundings or environment [2] and therefore it is presumed as energy source in many countries like India, Indonesia, Brazil, etc [3]. In many developing countries with increasing population the amount of agricultural wastage also increased. These wastage get decompose and burnt due to this the smoke of the wastage cause air pollution. So to avoid this issue biomass briquette is an another way of using agricultural waste. It is not proper way to burn biomass waste directly in domestic

(cooking, heating) as well as industry applications (agro industries, food processing). There is also a problem of handling, storage and transportation regarding with it. To handle the biomass waste the efficient way is to produce it in the form of briquettes [4]. Briquettes made by compressing the material into a solid product of uniform size and shape. The things that allow them to use as fuel just like wood or charcoal [5][6].

The present study aim is to:

- [1] Produce briquettes by automatic screw press.
- [2] By using agricultural waste produce briquettes in minimum cost.



Fig -1: Different types of briquettes

2. BRIQUETTING PROCESS

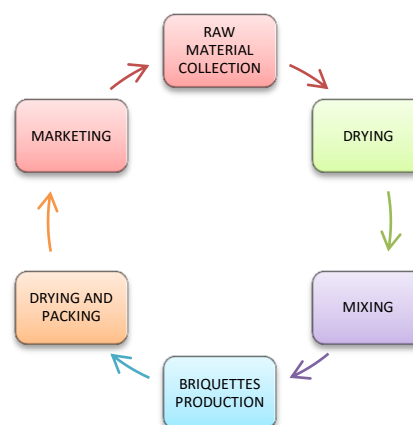


Fig -2: Briquetting process

3. COMPONENTS

The briquettes making machine consists of the following components.

The Main Frame - The main frame support the other parts of the machine. The frame made from mild steel plates. These plates are very useful for the fabrication of briquettes machine.

Hoper - This is where from the raw material is fed into the machine. It is generally conical in shape and made up of mild steel. The hopper size is designed in such a way that maximum raw material can be fed which can increase the production rate.

V-Belt - The belt is used for power transmission between motor and the shaft. A belt is used to link two or more rotating shafts mechanically. Belts are used as a source of motion to transmit power efficiently. Great amount of power can be transmitted from one pulley to another. The advantage of v-belt is it provides longer life and can be easily installed and removed.



Fig - 3: V-belt

Pulley- It is made of cast iron. Two pulleys are used one is driven by electric motor and other on screw. The drive element of a pulley system can be a rope, cable, belt or chain that runs over the pulley inside the grooves.



Fig - 4: Pulley

1 HP Motor- An electric motor is used to convert electrical energy into mechanical energy. Electric motors operate through the interaction between and electric motors magnetic field and winding current to generate force.

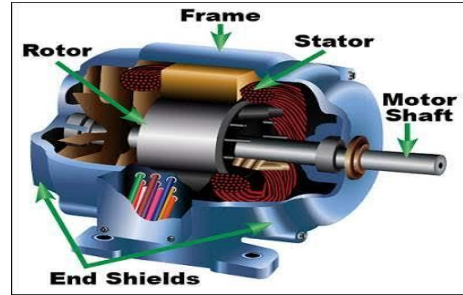


Fig - 5: 1HP Motor

Bearing - A bearing is a machine element which supports another moving machine element and reduces friction between moving parts. It permits a relative motion between the contact surfaces of the members, while carrying load. Bearings are classified broadly according to the type of operation, the motions allowed or to the directions of the loads (forces) applied to the forces.



Fig - 6: Bearing

Screw - It is a power driven rotating screw for power transmission. Is a rotating machine element usually circular in cross section, which is used to transmit power from one part to another. The various members such as pulleys and gears are mounted on it.



Fig - 7: Screw

Table 1. Components and description

Components	Description
The main frame (M. S. Plate)	4.5 mm
V-belt	B-65
Pulley (Cast Iron)	10 inch (Section B) 2 inch (Section B)
1 HP Motor	14 rpm
Bearing	N 6210
Screw (Cast Iron)	2 inch dia.

4. THE DESIGN

1) Power developed by shaft - Power developed by shaft can be calculate by using this formula,

$$P = \frac{2\pi NT}{60} \quad (7)$$

Where,

N - Speed of shaft

P - Power developed by shaft

T - Twisting moment or torque acting on the shaft

2) Speed of shaft - Speed of shaft can be calculate by using formula

$$\frac{N_1}{N_2} = \frac{D_2}{D_1} \quad (7)$$

Where,

N_1 - Speed of motor

N_2 - Speed of shaft

D_1 - Diameter of motor pulley

D_2 - Diameter of shaft pulley

3) Calculation of Torque - For belt drive torque can be calculate by using formula,

$$T = (T_1 - T_2) R \quad (7)$$

Where,

T - torque pulley

T_1 - tension in belt "tight"

T_2 - tension in belt "slack"

R - radius of shaft pulley

4) Tension in the tight side of the belt - Tension in the tight side of the belt can be calculate by using this formula,

$$T = T_1 + T_c \quad (7)$$

Where,

T - maximum tension

T_1 - tension in belt "tight"

T_c - centrifugal tension

5) Tension in the slack side of the belt - Tension in the slack side of the belt can be calculate by using formula,

$$2.3 \log \left(\frac{T_1}{T_2} \right) = \mu \cdot \theta \cdot \operatorname{cosec} \beta \quad (7)$$

Where,

T_1 - tension in belt "tight"

T_2 - tension in belt "slack"

μ - coefficient of friction

β - groove angle of the pulley in degree

θ - angle of contact in motor pulley

6) Power transmitted by belt - Power transmitted by belt can be calculate by using formula,

$$P = (T_1 - T_2) V \quad (7)$$

Where,

P - power transmitted by belt

T_1 - tension in belt "tight"

T_2 - tension in belt "slack"

V - belt velocity

7) Machine efficiency - Machine efficiency can be calculate by using formula,

$$\text{Machine efficiency} = \frac{\text{Power transmitted by motor}}{\text{Power developed by shaft}} \times 100 \quad (7)$$

8) Maximum bending stress on the shaft - Maximum bending stress on the shaft can be calculate by using formula,

$$\sigma b(\max) = \frac{1}{2} \sigma b + \frac{1}{2} \sqrt{\sigma b^2 + 4 \tau^2} \quad (7)$$

Where,

$\sigma b(\max)$ - maximum bending stress on the rotating shaft

σb - bending stress induced due to bending moment

τ - shear stress induced due to twisting moment

5. PROPERTIES OF BIOMASS

Table 2. Raw materials with different calorific values

Agricultural waste	Cal./kg.	Ash content
Bagasse	4700 k	1.80 %
Babool wood	4707 k	0.90 %
Rice husks	3200 k	22.20 %
Cotton stalks	4200 k	3.01 %
Groundnut shell	4500 k	3.80 %
Soya bean husks	4170 k	4.10 %
Sugarcane waste	3700 k	10.00 %

6. WORKING

The raw material such as bagasse, babool wood, groundnut shell, soya bean husk, sugarcane waste, etc are gathered together and are added to the hopper in the required ratio to get the compact briquette. The briquettes making machine is operated by electric motor. Firstly the agricultural waste such as rice husk, bagasse, ground nut shells and husk of soya bean has been poured through hoper. Then get start the motor and it is coupled with the screw by the help of v-belt and pulley. Due to this mechanism the sliding screw goes forward and it exerts pressure on plate which is attached to the screw. This plate presses the raw materials which is fed into the chamber and compress the raw material into briquettes. After that the sliding member is moved back to its initial position. This process is repeated to manufacture briquettes in continuous manner. So the finished product briquettes we get are completely clean, that is perfect for use in boilers, furnace and open fires.

The density of biomass briquettes is higher than black coal.

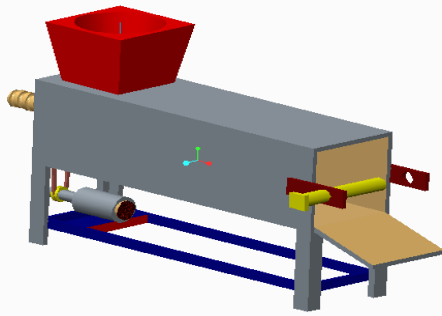


Fig – 8: Isometric View of The Machine

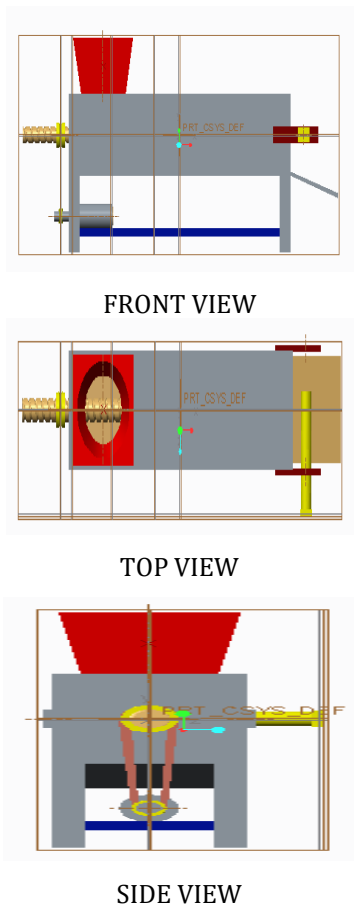


Fig – 9: Orthographic View Of The Machine

7. COST ESTIMATION

Table 3. Cost estimation of briquettes making machine

Sr. No	Components	Cost in rupees
1	Mild steel plate	5,200
2	Screw, V-belt, pulley	2,000
3	Electronic components and setup	10,000
4	Nuts and screws	800
5	Miscellaneous charge	2,000
Total cost in rupees		20,000

8. ADVANTAGES

- [1] The construction and working of machine is simple.
- [2] The briquettes are inexpensive than coal.
- [3] Briquettes not contain any chemical element, so it does not pollute environment.
- [4] No skill labours are required to operate this machine.
- [5] Less maintenance cost.
- [6] Easy to operate.
- [7] We can earn money from this machine.
- [8] Briquettes are easy to handle, store and transportation.
- [9] Briquettes have much lower ash content as compare to coal.

9. APPLICATIONS

Biomass briquettes are widely used for thermal application like boilers, furnace and foundries. For heating purpose like residential and commercial heating for winter, household applications, hotels, canteens, etc.

Boilers	Sugar mills, paper mills, food processing units, etc. using fuel for steam generation and heating.
Foundries	For metal heating and melting.
Brick kilns	For firing of furnaces.
Residential heating	Hotels, canteens, for winter heating in cold areas.

10. CONCLUSIONS

The automatic screw press briquette machine is designed. It is easy to handle and fabricated with materials sources locally. And it can be concluded that from waste material biomass briquettes can be produced. So we can use this machine for domestic (cooking, heating) as well as industrial purpose (agro industries, food industries). Recycling biomass materials into briquettes contributes to solving rural needs by generating income, providing a new cheap alternative source of cooking energy, avoiding to having to cut down more forests for fuel wood and ultimately promoting a sound environment.

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BIOGRAPHIES



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