

# International Journal of Innovative Research in Science, Engineering and Technology

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## Manufacturing of Biomass Briquetting Machine

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**ABSTRACT:** Demand for renewable energy is increasing day by day. Need of renewable source of energy is important now a days. Renewable energy sources have lower impact on environment as compared to conventional energy sources. For renewable source of energy agricultural residues are required, they are large in quantity. The main ingredients of biomass briquettes are agricultural waste product (ex. Paper pulp, plant leaves, sugarcane, wheat powder etc). Briquettes are very cheap in price cause they are manufactured from agricultural waste product. We are substituting the product which has large environment impact and also which leads to high pollution. Our experimental work is to produce machine which uses product manufactured from agricultural waste which avoid pollution to the environment. Also biomass briquettes machine is small scale business in rural areas.

**KEYWORDS:** Biomass, Biomass Briquettes, Bio fuel, Calorific value, Saw dust, Organic materials

### I. INTRODUCTION

Growing energy demand in the world force people to find alternative energy sources. Unlike coal or other fossil fuels, renewable energy sources are promising for the future, which leads to less environmental pollution. Especially, biomass is effectively used as energy bio sources such as fuel for boilers and furnaces due to its high calorific value. The aim of this project is to develop a biomass Briquetting Machine. Biomass is organic matter derived from living, or recently living organisms (or such as plant leaves sugarcane wheat powder) Biomass can be used as a source of energy and it most often refers to plants or plant-based materials that are not used for food or feed, and are specifically called agricultural biomass product. As an energy source, biomass can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of biofuel. Conversion of biomass to bio fuel can be done by different methods which are broadly classified into: thermal, chemical, and biochemical methods. Biomass is an important source of energy worldwide and is largely available on earth. Many other types of biomass energy can be used now which consists of trees, agricultural crops and associated residues like plant fibre, animal wastes, and organic industrial waste. Emission from burning of biomass is carbon dioxide neutral since it absorbs the same amount of carbon dioxide when growing as a plant. Converting to high density biomass increases its calorific value to high level. This high value biomass product are used in machine name as biomass briquettes machine in which with the help of binder material, this biomass product are combined together to form biomass briquette. This used for further operation in boiler plant or etc. Biomass briquette machine is also a small scale business for rural areas. Though it has large advantages in business industry also hence it found very useful in small scale industry. biomass is carbon dioxide since it absorbs the equal amount of carbon dioxide when rising as a biomass plant. Biomass are used as a solid fuel, or it can converted into liquid or gaseous forms. It can be used to produce electric power, heat, chemicals, or fuels.

### II. PROBLEM STATEMENT

Main Aim of this project is the biomass materials are compressed into briquettes so that they can be used by energy producing companies interchange to charcoal. These burn are just like charcoal but they do not produce any harmful or dangerous effects to the environment. They can be used to boil water and power turbines to generate electricity. These briquettes are replacement for fossil fuel such as oil and coal and also provide more calorific value per Kg and these

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products are available at low cost thus saves 30 to 40 of the boiler fuel cost. Burning of the briquettes are more efficient than burning the charcoal and firewood. The objective of this project is also to decrease the volume of shredded waste and thereby reducing the cost and fuel required in disposal process. It will mean less cost and safe energy for everyone.

### III. LITERATURE SURVEY

There are few papers available on biomass briquetting machine where behavior of material under transverse loading has been studied. SupriyaDarekar, Mahesh Kulkarni [1] studied For increasing the performance we can use the methods such as increasing the number of dies, height of machine, using electric motor. The machine is economical. This machine is very useful in the rural areas. the study on the development of a biomass briquetting machine is of great importance to poor and developing rural areas as it addresses the issues surrounding the efficient utilization of abundant quantities of agricultural wastes and residues which provide an enormous untapped fuel resources. Manoj Kumar Sharma, Gohil Priyank [2] studied The biomass briquettes can be replacement for the natural fuels like wood or coal. This are also used for the boilers. Mostly This are used in the developing countries. this briquettes can be used in any appliances meant for burning wood or coal. certain changes in operating parameters especially the distribution of primary and secondary air will have to be described in above paper. Obi, O.F., Akubuo, Okonkwo [3] studied The production rate can be increased upto 43 kg/hr. For the optimum sawdust briquette quality on the compressed density, a blending ratio is 100:25 & 100:35 could be used for briquettes. it can described the study on the development of biomass briquetting machine is of great importance to poor and developing countries. the physical and combustion properties of sawdust briquettes were found to be significantly affected by binder level. S.C. Bhattacharya, M. Augustus [4] studied The biomass can be preheated for good binding. The pre heating increase the binding of the biomass briquettes. This is helpful in the increasing the production rate. he discovered average saving in the electrical energy consumption due to preheating were 23.5% at heater 10.8 at motor respectively, the average total energy saving was about 10.2% the biomass stove developed for die-heating was found to perform satisfactorily and requires periodical fuel loading and ash scrapping. DR. Pushpa Jha, Pramod Yadav [5] studied the Agricultural waste can be used for manufacturing of briquettes. This briquettes have the high specific density 1200-1450 kg/meter cube. They are also produced the less pollution. the good quality of briquettes of sawdust can be produced by controlling number of process variables like moisture content of feed mixture, particle size of the feed. Power consumption can be decreased by increase in the percentage of binder in the feed. Tamilvanan [6] studied The experimental work focuses on developing a method to manufacture briquettes of consistent quality at low pressure by employing wet technique. In this experiment he focuses on developing a method to manufacture briquettes of consistent quality at low pressure by employing wet technique and suggest a way to burn them in a control manner. these techniques were used to carry out a study on cylindrical shaped briquettes.

### IV. MATERIALS SELECTION FOR BRIQUETTES

Biomass briquettes are a type of fuel that is substitute to coal and the charcoal. The biomass briquettes are generally made up of the trees waste, agriculture waste and forest waste. Biomass briquettes are also made up of green waste are converted into the high density biomass or increased the calorific value of the biomass briquettes with the help of the machines that are uses the binder or binder less technique or some organic materials. In biomass briquetting machine there is no use of any chemical or other natural materials for nature, it is 100% natural. The major raw materials for manufacturing biomass briquettes are sawdust, forestry leaves, dry tree leaves, wood waste, another kind of organic waste, risk husk, cumin waste, cotton flowers, cotton stalk, madden bhells, betelnut shells, almond shells, pista covers, castor seed shells, jute waste, bamboo dust, groundnut shells, coffee husk, bagasse etc. this sawdust are offers eco-friendly production of white coal briquettes for biomass briquettes. Biomass are generally used for type of thermal applications like boilers, for heating purpose, heating in cold weathers and hotels, canteens, kitchen appliances. This sawdust are compressed part is to make the briquettes.

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Table 1: System Components And Materials

SR.NO.	PARTS	MATERIALS
1.	Dummy Wheels	Rubber
2.	V-Belt	Rubber
3.	Pulley	Steel
4.	Pipe	Mild Steel
5.	Plate	Mild Steel
6.	Frame	Square Pipe

Starch is the common binder it is usually costly than other. In general, nearly about 3-7 of starch is needed to make the briquettes. Starch sources are cornstarch, wheat starch, maize flour, wheat flour, rice flour, cassava flour, potato starch, etc. To use the starch as a binder, you first combine the starch, which is added to water and heated to form a sticky consistency, then adding to the mixer to be mixed with the charcoal powder. Clay is available at almost free cost in many places. A briquette contain nearly 14 of clay. Clay does not add the heating value of the briquette. If more clay is added, the briquette will ignite and burn halfly. Besides, clay will turn into ash after burning, which blocks the passage of heat, resulting in the loss of heating value of the charcoal. Gum Arabic, also known as acacia gum, this gum is a natural gum collected from acacia tree, which is very common in Africa Sahel, especially Senegal, Sudan, etc. Gum Arabic is used as binder material for coal briquette. no smoke emitting, or no thermal treatment is needed. Wood tar process is generally arise during carbonization process and recovered from stationary retorts. Pitch is liquid that remains after the distillation of coal tar. Tar is have liquid where pitch is solid.

### V. WORKING PRINCIPLE

We are going to manufacture a machine which replaces the use of fossils fuels such as kerosine, coal , pollution making material . In this we are using agricultural waste product to manufacture briquettes. In a biomass briquette machine first we have to start a machine. When we started the machine the motor starts running . We have connected two pulleys to the motor with the help belt conveyor. For power transmission we have connected shaft to the second pulley and third pulley . With the belt conveyor again we have connected third pulley with the fourth pulley. This power transmission used for screw propeller which impact force on material. At the end of screw propeller we have mounted die and hooper on it. When machine gets started we have to put mixture of raw material and binding material in it. It contains raw materials such as sawdust , agriculture waste , rice husk, coffee husk , coir pitch , sugarcane, bamboo dust , wheat straw etc and binding material such as starch , clay , gum Arabic, wood tar , paper pulp etc .

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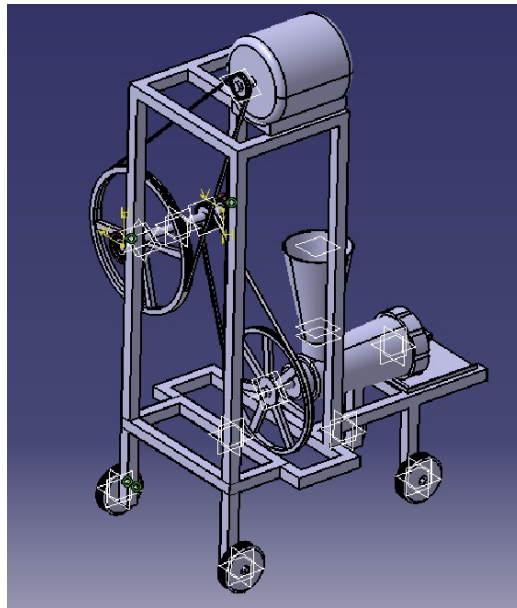


Fig.1: Cad Model of Biomass Briquetting Machine

The briquettes which are manufactured from machine are tested with different kind of binding material. In this we have use starch,clay,gum. In the end we have manufacture different kind of briquettes with different kind of binding material and raw material,and finally by testing specification of briquettes which have higher calorific value as well as higher burning time we selected that briquettes for higher mass production. Finally, we will get the small briquettes from the machine.

## VI. DESIGN CALCULATIONS

Belt design calculation - For power transmission we have used v belt. In v belt cords transmit the force from driver to driven pulley. V belt have higher velocity ratio and higher efficiency up to 94% to 98 %. They are quite in operation and permit higher speed.

Power to be transmitted =  $P = 0.2 \text{ Kw}$

$N = 1423 \text{ rpm}$

$D = 50 \text{ mm}$

$N_2 = 238 \text{ rpm}$

$D_1 = 50 \text{ rpm}$

Correction Factor: According to service (i.e., for screw extrusion process)

Design power = transmitted power =  $1.00.2 = 0.2 \text{ HP}$

According to rpm and design power from table V belt of B-type selected Speed ratio = 5.9

Length of belt =  $L = 2C = 2400 + (300+50)/2 + (300-50)*2/4 = 1014.2 \text{ mm}$

From table preferred belt length = 1016 mm

Correct centre distance =  $2C + 898.49 + 1640 = 2C + (300+80)/2 + (300-80)*2/4$   $C = 405 \text{ mm}$

Correction Factor for belt length  $F_c = 0.99$

Correction factor for arc of contact =  $s = 180 - \sin^{-1}$

$S = 155.06$

Where,

$s =$  wrap angle for small pulley (degrees)

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FD=0.94

Power rating for single belt 0.25KW. Depending on d, D speed rating.

No. of Belts = 0.95 = 1 Belt

Where

P = drive power to be transmitted

Fa = correction factor = 1.2

Pr = power rating of single v belt = 1.0

Fc = correction factor for belt length = 0.95

Fd = correction factor for arc of contact = 1.06

## VII. CONCLUSION

A large volume of agricultural by products being generated in India and which constitute environmental hazards. Call for effective utilisation of that high grade biomass material for solid fuel called briquette. Hence it can be concluded that the waste material like dry leaves, wheat straw, saw dust, etc. are feed stocks for the biomass briquette. Generally dry leaves and wheat straw are burnt to reduce waste, which causes several pollution to environment, but if wisely handled these wastes can then could be a better option for briquetting. Hence for an agricultural country like India that produces huge amount of agricultural waste every year, use of these waste as a briquette can be economically viable, sustainable and environment friendly solution. And also as machine concerned, it can be concluded that by using simple mechanism with widely available machine element the machine cost could be lowered and makes fabrication economical and portable.

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