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## Design and fabrication of White Coal Pallet Machine

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### ABSTRACT

The present paper focuses on production of white coal which is made from a Bio waste as an alternative fuel. With fast depletion of Conventional energy sources such as coal, petroleum and diesel etc. now it's the time to switch over to such resource which is freely available in nature i.e. Bio-waste which proves a good substitute over conventional energy resources. Biomass briquettes avoids adding fossils carbon to the atmosphere. The extrusion production technology of briquettes is the process of extrusion screw wastes (straw, sunflower husks, buckwheat, etc.) or finely shredded wood waste (sawdust) under high pressure. The use of agro waste in the form of solid white coal by adopting the piston cylinder ram pressing technology will not only arrest the ever increasing diminution of conventional fuel like coal lignite, fire wood & furriness oil etc., but also reduce cost of imports and save foreign currency and be helpful to utilize huge resources of forestry waste, agricultural waste and industrial wastages, it is step further to make our country pollution free. There is a tremendous scope to utilize the waste of convention energy sources through the development, propagation of non-convention briquettes technology i.e. briquettes machine, briquettes plant, biomass briquettes plant for production of agro residue briquettes to meet thermal energy requirement. Therefore this substitute energy medium is given national priority as appears to be the only permanent solution into restriction of the national laws and avoid pollutions. White coal is cheaper in cost & raw material is sufficiently available in almost all part of India for production. This machine proofs a boon to rural areas peoples.

**Key Words:** Agriculture waste, Alternative fuel, Drying waste, Electricity.

### I. INTRODUCTION

The legacy foundation has developed a set of technique to produce biomass briquettes through artisanal production in rural villages that can be used for heating and cooking. These techniques were recently pioneered by vicuna national park in eastern democratic republic of Congo. The economics of two countries i.e. India and China are rapidly increasing due to cheap ways of harnessing electricity and emitting large amounts of carbon

dioxide. The large scale use of commercial energy has led to better quality of life; however it has also created many problems. Perhaps the most serious of these are the harmful effect on the environment and climate changes which both have consequences on human health and pollution. White coal replace the fossil fuels which is a biomass/ white coal, white coal is totally made from agriculture waste and it does not create any type of pollution. Energy problem is very serious and the main objective is

now to find solution to match demand and supply of energy sources.

The electricity consumption of white coal is much lower than other fuel also possess less ash content as compared to black bustard coal. We can produce small white coal for domestic combustion purpose which is made in white coal machine. The requirement of coal in power plant in metric ton so it is not possible to produce pellet to power plant that is why made white coal from agriculture waste in large quantity which has finished product, 75mm in diameter and 159mm- 400mm length production in white coal press machine.

**1.1 Raw Material for Pallets:**

There are a wide range of materials that can be used in making of white coal. Deoiled cashew shell, rice husk, dry grass, glyceride, saw dust and cow dung. The carburised cashew shell, rice husk and grass are used as major components for briquetting without any binder material.



**Figure 1.** Different materials used for making pallets

The agricultural wastes like cotton balls, straws, coconut shells, castor seeds, forest leaves, wood chips and rise husk and paddy straw. Various combinations of major constituents are mixed in

order to get briquettes of desired quantity Different combinations such as 50:25:25, 25:50:25 and 25:25:50 for cashew shell, rise husk and grass are respectively added for observing the properties of briquettes.



**Figure 2.** Process showing from Bio waste to pallet making.

**1.2 LITERATURE REVIEW:**

Jing Zhang [1] studied the influence of temperature, pressure, size of particle and moisture content on the physical properties (durability, density, impact resistance & compressive strength) of korshinskii kom briquette press machine. A piston cylinder simple pressing mechanism process was used to densify the material into white coal.

Research on Physical properties Temperature, pressure, size of particle & moisture content - Drying of raw material process can be done in atmospheric condition to reduce moisture content. Rukayya I. Muazu [3] He identified biomass densification process increase fuel energy density for more efficient transport. It show blending different types of biomass improves the properties of densified white coal. Making briquette or white coal used blending technology.

**1.3 MANUFACTURING PROCESS:**

This project is called biomass briquetting project and is simply a process of converting agro waste and forestry waste into biomass briquettes/bio coal. The

biomass briquetting is the best renewable source of energy for healthy environment and economy. It's a complete eco-friendly project.

A piston cylinder arrangement is used for reciprocating mechanism of materials. Approx. a cylinder of 90 mm diameter and 400mm length is selected. An air tank for collection of pressurised air is required. A stroke deflector is used for reciprocating the pressurised air throughout the cylinder. A locking mechanism is used to hold the cover of the compressing cylinder. A compressor is required for providing the pressurised air to the machine.

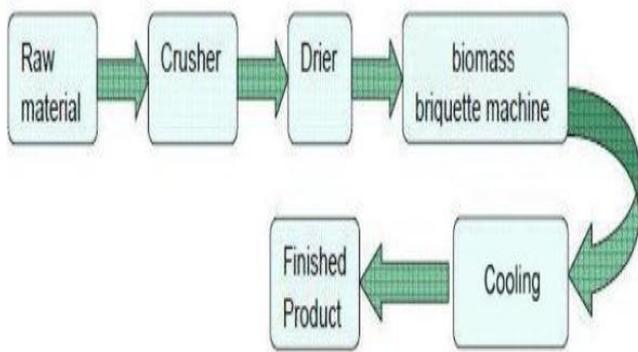


Figure 3. Processes Flow Chart

**II. WORKING**

The materials are fed into the machine's cylinder up to the brim and is sealed by the cover. The compressor gives the pressurised air to the air tank. After enough volume of air is stored in the tank the pressurised air goes to the deflector. The deflector then pushes the piston upwards so that the other link attached to the piston gets pushed along with it. The deflector then pushes the piston from upward position to downward along with the material. This process repeats itself up to 1 stroke to make a cylindrical briquette. The second stroke is applied to the cylinder while opening up the cover to take away the formed briquette.



Figure 4. Simple Model of Pallet Making Machine

**2.1 ADVANTAGES OF USING BRIQUETTES COMPARED TO OTHER SOLID FUELS**

- Briquettes are much cheaper than ordinary coal.
- Oil, coal or lignite, once used, cannot be replaced.
- There is no sulphur in briquettes, thus does not pollutes the environment.
- Biomass briquettes have a higher practical thermal value.
- Briquettes have much lower ash content (2-10% as compared to 20-40% in coal).
- Combustion is more uniform compared to coal
- Briquettes are usually produced near the consumption centres and supplies do not depend on erratic transport from long distances.
- Briquettes give much higher boiler efficiency because of low moisture and higher density.

**2.2 ADVANTAGES OF SETTING UP BRIQUETTES PLANT PROJECT**

- High sulphur content of oil and coal, when burnt, pollutes the environment.

- There is no fly ash when burning briquettes.
- Briquettes have consistent quality, have high burning efficiency, and are ideally sized for complete combustion.
- Combustion is more uniform compared to coal and boiler response to changes in steam requirement is faster due to higher quantity of volatile matter in briquettes.
- Compared to fire wood or loose biomass, briquettes give much higher boiler efficiency because of low moisture and higher density.
- Briquettes, are easy to store, pack and hygienic to handle.

**2.3 Advantages over economic feasibility and profitability**

1. Farmer earn money by selling agriculture waste
2. Early payback period
3. Growth potential is excellent
4. High profitability
5. High employment potentiality
6. Product easily market
7. Save foreign currency

**2.4 Other Advantages-**

1. Reduce CO2
2. Free from pollution
3. High energy content
4. Reduce coal dust level
5. Low transportation cost
6. Broad geographical application
7. Simple mechanism

**APPLICATIONS:**

1. It can be used in rural areas for the purpose of cooking.

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

**Table 1**

Boilers	Sugar mills, paper mills chemical plants, cement, food producing units, oil extraction units etc. using fuel for steam generation and heating.
Forges and foundries	For metal heating and melting.
Brick kilns and ceramic units	For firing of furnaces.
Residential heating	For winter heating in cold areas and in restaurants, canteens etc.
Gasification	The gas can be used to generate power, and eventually replace coal based producer gas systems and oil firing in furnaces.
Agriculture	Heating green houses, nurseries and chicken coops.

Following Industries Can Make Maximum Use Of Briquettes:

1. Ceramic and Refractory Industry
2. Solvent Extraction Plant
3. Chemical Units
4. Dyeing Plants
5. Milk Plants
6. Food Processing Industries
7. Vegetable Plants
8. Spinning Mill
9. Lamination Industries
10. Leather Industries
11. Brick Making Units

- 12. Other Industries having Thermal Applications
- 13. Gasifies system in Thermal
- 14. Textile Units

**Characteristics of general bio waste pallet.**

**Table 2**

Calorific values	4000 – 4500 KCal./Kg
Sulphur	White coal free from sulphur Content
Pollution	Pollution free
Fly ash content	2-9% ash content present
Availability	White coal is future fuel, available in plenty
Fuel use in boiler (better heat result/less cost)	Economic and less cost
Storage	Easy to store
Environment	No effect on health
Farmer economy	Making rich to peasant/ local employment

**Key Features Of The Briquettes Plant Project**

- a. High profitability
- b. Excellent growth potentiality
- c. Ready market
- d. Wide variety and easy availability of agro-waste from various crops
- e. Short gestation and quick returns
- f. Employment potentiality
- g. Conversion of natural resources into hi-tech energy and maintenance of ecological balance

**Table 3**

Fuel type	Heat content kcal/kg
Wood (Wet)	2388
Wood (Dry)	2866

<b>Sawdust Briquettes</b>	<b>4300</b>
Black coal	4770
Natural gas	7640

**III. RESULTS AND DISCUSSION**

**3.1 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

Below we can see heat content chart for mostly used fuels to present.

**3.2 Economical Than Other Fuels**

1. It is more economical than others as it possess the following properties.
2. It is cheaper than heavy furnace oil, steam coal fire wood etc.
3. Consistent quality.
4. Low cost as compare to others fuels as well as negligible amount of ash content.
5. Efficient duel ideally sized 90mm diameter and 6 and 12 inch length

**IV. FUTURE SCOPE OF WORK:**

Our main task is to stop and minimize the carbon emission as far as possible while producing briquettes by blending with some other material in order to save the environment from toxic Sulphur

pollutants. Already the pallets were using in certain industries but our main objective is it doing for the rural areas peoples and for that we are suggesting the applications of this pallet making machine in smokeless chullah. So that the pallets or briquettes will be getting manufactured in an eco-friendly way as well as it burnt with no smoke fumes and it doesn't create any type of pollution in the environment.

## V. CONCLUSIONS

The focus of our project is doing something for the farmer's one and to develop such a machine that its design should be simple, efficient. These briquettes can be used in any appliances meant for burning wood or coal. However, certain changes in operating parameters especially the distribution of primary and secondary air will have to be incorporated into the conversion. One should first understand the specific characteristics of briquetted biomass before taking steps to make changes in appliances.

With the help of our project almost simpler design of the machine get reached but still some work is remaining so that we can use utilize maximum benefits from nature. For this purpose we are giving suggestions of using Hydraulic Cylinder instead of Pneumatic cylinder and evaluate the results. Also try to incorporate new mechanism of doing same work. As day by day conventional resources get depleting day by day in such conditions definitely this white coal pallets will proof a Boon For Farmers.

India is the only country where the briquetting sector is growing gradually in spite of some failures. As a result of a few successes and IREDA's promotional efforts, a number of entrepreneurs are confidently investing in biomass briquetting. These

entrepreneurs are also making strenuous efforts to improve both the production process and the technology.

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