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Designing of a Coconut Chopping Machine and Making Fuel from Tender Coconut

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Abstract

Objectives: India is known for its production of tender coconuts. Crops laid throughout the year not like any other fruits or vegetables for every 3/6months. The usage of coconut is immense (especially India) like in temples, homes, drinking purpose etc. (on regular basis). We can see lots of tender coconut shells as waste after using in above places and found them near to street bins and road sides. **Methods/Statistical Analysis:** Our paper is focusing on utilizing that waste in to coconut Briquettes. The tender coconut will be mashed in to pieces and then conjure by special pressing machine, while pressing the coconut shell will be inflamed to remove Moisture. Briquettes produced by this procedure will be having hallow elliptical shape Thus the briquettes we are looking to replace fuel is formed. **Findings:** The main difference from normal coal to our paper is effective and also environment friendly. These solid briquettes can be burnt up to 2-3 hrs. Whereas normal peat only lights up to 20 minutes at the max. **Applications/Improvements:** The normal coal produces carbon dioxide, sometimes carbon monoxide and Sulphur oxides. But this coconut shell brick lead to clean environment. Our aim re-usage of waste and keep environment clean.

Keywords: Briquettes, Crops, Elliptical, Street, Temples, Vegetables

1. Introduction

Coconut or Tender Coconut by hearing this word, the first country to hit our minds is INDIA as obvious. Coconuts are used on regular basis in many applications and events like marriages, ceremonies, temples, drinking purpose etc. Every one use the water or white flesh inside it[1–6]. After the usage it will be thrown out, the waste form is enormous with good fiber content which can be utilized in many aspects we as a first step converting those shells in to briquettes.

In our day to day life most of our food preparation works related to heat applications. Now a days we have different types of heat sources like micro woven, Gas stove, Electrical heaters and microwave oven. Where as in villages still they depended on normal furnaces and peat as fuel. In general they are using fuel from dried trees, leaves and agriculture wastages. The unburnt gases produce from those (agricultural waste and peats) are toxic[5–12]. Keeping this into account we modified the system of their fuel generation by converting the waste to briquettes, so that they are safe to handle, store and more importantly nontoxic. Not only in villages can these be used as fuel for thermal power plants, little furnaces where coal is used as primary fuel[13–15].

Coming to structure and composition, coconut shell is hard and tough in nature. On regular basis in villages, coconuts are dried in sunlight for 15-20 days and then it will be used as fuel. By doing this we can't guarantee that the whole raw material will be burnt not only that if these (dried coconuts exposed to rain or to a wet moisturized[15–20] environments we can't usage them for another 15-20 days. Storage is another hurdle they will scatter these coconut on road side, some might be washed out by vehicles and some by animals. To replace that we straight away give the fuel in terms of brick whenever they are in need they can utilize, if it is exposed to water or wet moisture in 4-5 days it can get back to its form. Storage oriented a small

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shelf is more than enough to keep the briquettes[20–22]. In order to get in to brick form the coconut shell need to undergo different process. Firstly the waste coconut shell are gather and spread on a colander and then fed in to a masher (where all these coconut shells will be cut in to pieces with different sizes followed by a separation chamber. These nibbles of coconut are dried in sunlight for days and then grind it powder form. The formed powder will be mixed with water to form a briquettes. (A similar procedure of a brick attaining)

In this paper we are elaborating the machine parts and process to our desired output. The basic size and chopping pieces of tender coconut shown in Figures 1, 2 and 3.

2. Motor Specifications

We used two types of motors for Damper movement. The specifications of motors are in Table1and the layout of the figure shown in Figure4.

3. Cutting Machine

The waste tender coconuts are gathered and dumped in the inventory. A conveyer system connecting the damper and inventory. The Specifications of setup as follows in Table 2. The layout of the machine shown in Figure 5. The

Figure 1. Tender coconut initial.

Figure 2. After primary cutting.

Figure 3. Final output pieces in process.

Table 1. Motor specifications

S.No	Component	Specification
1	Electric motor	5 H P
2	Power supply	3 Phase
3	Rpm	1750
4	Supply	A C
5	warranty	3 Years
6	Voltage and current	Normal purpose Industry

Figure 4. 5HP high torque motor.

Table 2. Machine specifications

S.No	Name of the component	Specifications
1	Belt Conveyer	8 meters length
2	Damper Motors	a) 5 H.P Motor b) 3 H.P motor
3	Damper Pistons	a) 50 mm Diameter b)15 mm Diameter
4	Chopper Blades	10+5

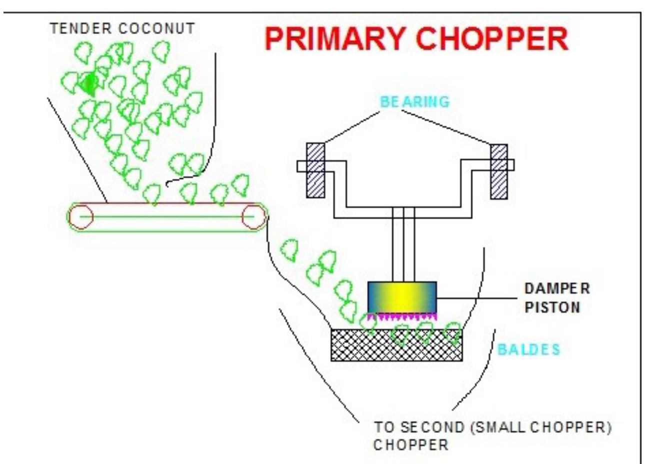

Figure 5. Primary chopper

chopping blades used two types. Those two are shown in Figure 6, 50 mm diameter blade and Figure 7, 10mm Diameter cutter.

3.1 Working Principle

The tender coconutsfed in to chopper machine through a belt conveyer. These huge structure will be cut down in to small up to 50 mm size slices or square pieces. These pieces collected in the bottom collector and further modified in to in 5 mm size pieces Shown in Figure 7 in the minor chopper which is shown in Figure 8.

Rate of Cut: The rate of cutting for 5mm size pieces is 5Kg/minute. In case of major chopper it is 12Kg/minute.

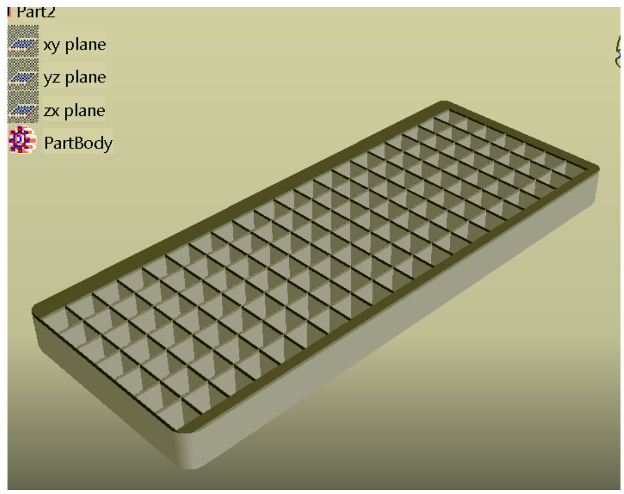

Figure 6. 50mm dia cutter.

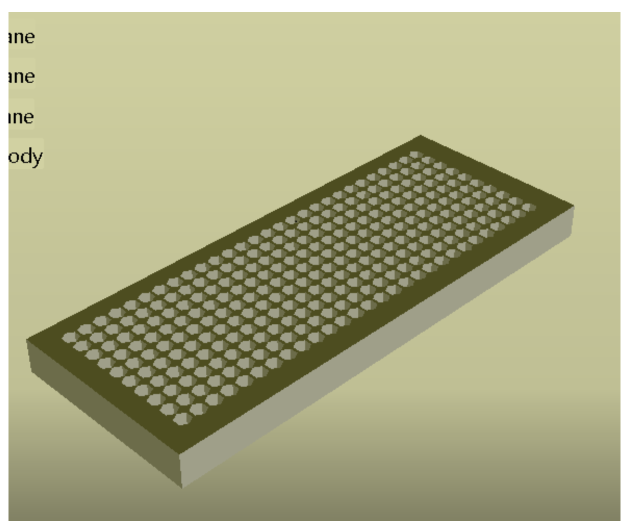

Figure 7. 10mm Dia cutter.

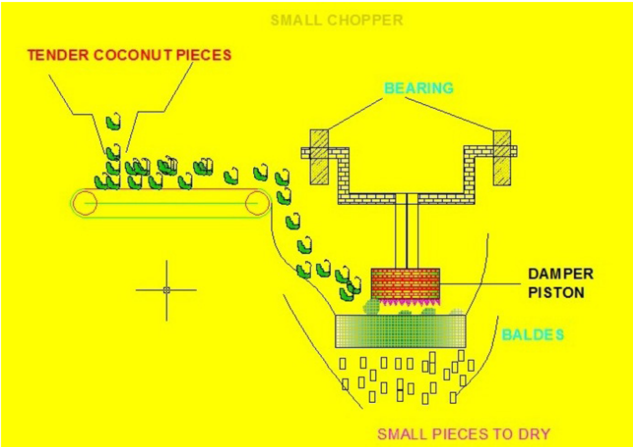

Figure 8. Small chopper.

The broken pieces are kept in presence of sunlight for 7 to 10 days depend on sun intensity.

4. Availability of Source

These calculations taken depend on the seller in respective state coconut seller and distributors. These may vary from 2 to 3% in production. As shown in Table 3

5. Drying of Pieces

The small size briquettes are keeping in closed case and applying heat in the absence of oxygen for some time to remove moisture[25, 26] content. To the kiln a vent hole is provided for smooth passage of gas. Now those briquettes we can use like a fuel for small scale industries which are going to run by het applications.

6. Results

Calorific values and other relevant information mentioned in the following table. These briquettes can replace the coal usage and LPG usage in sun rising industries which are running on Thermal applications. Uses include domestic applications because of its less smoke and odor. Output specifications shown in Table 4.

7. Advantages

1. Raw material is free of cost and it is freely available.
2. By reducing waste, we can Control the growth of mosquitoes in urban areas.

Table3. Production of tender coconut

S.No	Area	Production	Percentage
1	Andhra Pradesh	6.85	6
2	Karnataka	21.51	21
3	Tamil Nadu	19.10	19
4	Kerala	50.56	50
5	Maharashtra	1.09	2
6	Pondicherry	0.89	1

Table4. Specifications of outputs

S.No	Name	Specification
1	Calorific value	2800-3600Kcal/Kg
2	Ash content	10.5%
3	Moisture content	8.5%
4	Volatile matter	17-20%
5	Fixed carbon	65%-73%
6	Foreign Matter	11-13%

3. Deforestation can be avoided.
4. Low emissions.
5. Low ash content.
6. Easy to carry because of its cross section.

8. Conclusion

The briquettes were formed by the process explained above. The calorific value of these briquettes are much higher than of normal coal or wood. The shapes of briquettes can be in any form either spherical, rectangular etc., to our convenience we went on hexagonal structure. Overall it is a good replacement of fuel for domestic usage, in thermal power plants etc., where we use coal as source. Further studies and experiments will be conducted on mixing the mixture with cow dung for further effectiveness and for fresh environment.

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