



Research Article

FABRICATION OF LOW COST HAND OPERATED BRIQUETTING MACHINE

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Received: June 28, 2018; Revised: July 07, 2018; Accepted: July 09, 2018; Published: July 15, 2018

Abstract: There has been a recent push to replace the burning of fossil fuels with biomass. The replacement of this non-renewable resources with biological waste would lower the overall pollution of the world. Agricultural residues are producing in large amount but they are used inefficiently that pollute the environment. Apart from the problems of transportation, storage, and handling, the direct burning of loose biomass in conventional grates is associated with very low thermal efficiency and widespread air pollution. To overcome these problems the biomass materials is compressed as 120 kg/cm³ and can increase its density and durability. In this study a machine was designed to density grinded biomass materials at optimum level of density to obtain more than 90% durability. The machine was consisting of a plunger, base plate, vertical support, mould. The grinded material of particle size less than 5 mm and moisture contents less than 12% placed in mould and pressed by pusher. The capacity of machine was 2 kg/hr.

Keywords: Biomass Briquettes, Sawdust, Cow dung, Dry leaves

Citation: Dongardive S.N., *et al.*, (2018) Fabrication of Low Cost Hand Operated Briquetting Machine. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 13, pp.- 6530-6532.

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Academic Editor / Reviewer: Rajesh R Gajbhiye

Introduction

The overall pollution in the world is increasing day by day and the major contribution to this pollution is the use of fossil fuels, hence there is huge push to reduce the usage of fossil fuels and to look for the alternative biomass fuel. Developing countries are facing huge problem with waste management and agro residues such as coir pitch, dry leaves, rice husk, coffee husk *etc.*, are contributing majorly to this problem. We usually see these agro residues and saw mill residues are usually burnt on roadside or dump yards, which again results in pollution. There is a need to find a way so that these agro residues and sawmill residues can be converted into fuels. However, these residues are very difficult to transport, handle, store and if these residues are burnt directly it results in very poor thermal efficiency and may create lot of air pollution. Biomass briquetting is the densification of loose agro residues, sawmill residues with or without binding agents to produce compact solid composites of different sizes with the application of pressure. The end use of briquettes is mainly for replacing coal in industry for heat applications (steam generation, melting metals, space heating, brick kilns, tea curing, *etc*) and power generation through gasification of biomass briquettes and for domestic uses. Biomass is an energy organic matter, especially plant matter, that can be converted to fuel and is therefore regarded as potential energy sources. There are various types of biomass such as agricultural waste, industrial waste, animal residues, plant residues *etc.*

Working of Parts and their Functions

The hand operated briquetting machine consists following main parts;

- The vertical support
- The base plate with grooves
- The pusher lever
- The plunger
- The mold
- The mold base plate

- The centre drainage tube
- The removal rails
- The front leg
- The top spacer

The Vertical Support

This vertical support is made from 38mm thick and 406mm long wooden plank joined together to produce a rectangular shape. The upper parts of the frame is called as top spacer.

Function

The vertical support gives the support to the main frame of the machine as well as it provide strength to the machine and spacing for the top spacer.



Fig-1 Vertical Support

The Base Plate with grooves

The base plate is made of wooden plank along with c grooves on it.

Function

The base plate act as a base of mould and to transfer the water away from the mould.



Fig-2 Base Plate with Grooves

The Pusher Lever

The pusher lever is made of the wooden plank having the dimensions 25mm×50mm×710mm.

Function

The pusher lever is used to create pressure on the plunger by pushing it downward.



Fig-3 Pusher Lever

The Plunger

The plunger is made up of cylindrical shape wood with hole at the centre.

Function

The plunger is used to place on the mold to press the biomass for removing the water from it.



Fig-4 Plunger

The Mold

The mold is a hollow cylindrical structure, made up of PVC pipe along with holes on it.

Function

Mold is used to provide a proper shape to the briquette and removing, excess water from the biomass mixture.



Fig-5 Mold

The mold base plate

Mold base plate is made up of PVC material with holes on it.

Function

It is used as base to the mold and it also remove excess water from the base of the briquettes

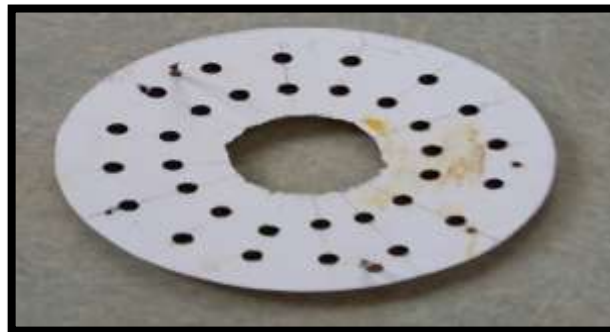


Fig-6 Mold Base Plate

The Central drainage tube

It is the tube which is placed at the centre of the mold and it is made up of PVC material with holes on it.

Function

It is used to remove excess amount of water from the centre of the briquettes.



Fig-7 Central Drainage Tube

The removal rails

Removal rails made up from the wooden block which are placed inner side of vertical support.

Function

Removal rails are used to remove briquettes from the mold.

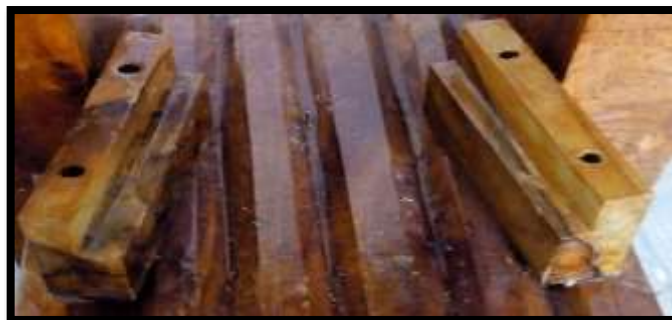


Fig-8 Removal Rails

The Front leg

The front leg made up of wooden block, on which base plate is placed.

Function

Front leg gives the support to the base plate and also give the slope to the base plate to drain excess water



Fig-9 Front leg

The top spacer

The top spacer is made up from the wooden block and it is fixed between the two-vertical support.

Function

The top spacer provide the support to the pusher lever for applying pressure on the plunger.



Fig-10 Top Space

Working

1. Make a mixture of saw dust, cow dung and water.
2. Put a disc on base plate.
3. Fix a drainage pipe inside the disc
4. Put a mold on the disc.
5. Now fill the mixture inside the mold
6. After filling the mixture place a plunger on it.
7. Now by using pressure lever apply pressure on the plunger, so that excess water is removed from the mixture.
8. After applying the pressure remove the disc from the bottom.
9. Put a mold on the removal rails.
10. Now again apply pressure on the plunger with the help of pressure lever.
11. Collect a briquette from the base plate.
12. Put it for drying.

Summary

"Densification" is the process of compaction of loose material and increase its volumetric efficiency. In this process the production of briquette is made from mixture of saw dust and cow dung at 1:1 proportion with same proportion of water. This mixture is made about 24 hour before the process. This mixture would then be compressed at pressure of about 120 kg/cm² into round cakes of diameter 7.62 cm (3 inch) and thickness 6 cm and dried into solar cabinet dryer at temperature about 700c or in open sun drying. Two person can make 25-30 briquettes in one hour. Density of briquettes made by this machine is 500-600kg/m². calorific value of briquette is ranges from 3800-4500 kcal/kg. The resulting briquettes are used as a solid fuel.

Conclusion

1. The briquetting machine work helps in waste management and also provides a way to reduce the use of fossil fuels in turn reduces pollution.
2. we concentrated only on some waste like rice husk, sawdust and dry leaves so further work needs to be carried out so that the different wastes can be converted into briquettes.
3. The briquetting machine had higher calorific value due to compression of biomass like saw dust, rice husk etc.
4. Bio-mass densification has been attracting much attention due to its

- high efficiency and good environmental performance characteristics.
5. It has also provided opportunity for the processing of agricultural residues, wood waste municipal solid waste into briquettes.
6. It has low maintenance as compared to other briquetting machines like screw press, piston press etc.

Application of research: The briquettes are made from hand operated briquetting machine used for cooking, water heating and space heating. It prevents the air pollution. The briquettes have no smoke, no spark and easily combusted.

Acknowledgement / Funding: Author thankful to College of Agriculture Engineering, Jalgaon Jamod, 443402, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra 444104, India. Authors also thankful to supportive staff of workshop department for their help in fabrication of briquetting machine

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Research project name or number: Development and Evaluation of Hand Operated briquetting Machine

Author Contributions: All author equally contributed

Author statement: All authors read, reviewed, agree and approved the final manuscript

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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