Hydraulic Briquetting Machine

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Abstract- *Waste not, want not. Waste is potentially a resource. From traditional point of view, the daily waste has been regarded as worthless however from the point of view of resource efficiency, the daily wastes can be recovered and recycled and reused at every procedures of production and consumption.*

The need for alternative sources of energy has been a sensitive issue for the past years. To minimize the dependence on imported fuel and to solve problems on energy shortage, considerable efforts have been made to utilize the country's available resources. The use of the several forms of renewable energy such as the geothermal, wind, and solar are studied and researched upon to maximize the benefits that can be harnessed for the country. Charcoal is a traditional fuel widely used in many developing countries to meet basically household needs. It is considered as the best fuel for the most of the traditional cooking stoves in many areas, and is preferred in the urban areas because of its smoke free burning. There exist a number of different commercial briquetting technologies in Asia, America and Europe. The expansion of the use of biomass as an alternative source of energy for heating applications depends basically on three factors: residue availability for briquetting, adequate technologies and the market for briquettes. There currently exist a number of machines developed for the production of biomass briquettes in developing nations. Some of the existing machines in the rural areas are either gender unfriendly, or having poor production capacity and briquette quality, and depends on direct human strength for densification.

Keywords- The main parts of HSWD are Frame, Die, Piston assembly, Hydraulic jack

I. INTRODUCTION

Briquetting is defined as the densification (agglomeration) of an aggregate of loose particles into a rigid monolith. A briquette can thus be defined as a product formed from the physico-mechanical conversion of dry, loose and tiny particle size material with or without the addition of an additive into a solid state characterized by a regular shape. Briquetting was first proposed in Russia by a Russian inventor F.P Veshniakov (Prokhorov, 1982). Veshniakov developed a method of producing briquettes from waste wood, charcoal and hard coal. The most important advantages of briquette are its low sulphur content, relative freedom from dust, ease of handling and high calorific value. Briquette making machines have been in existence and used for sawdust and waste materials. Briquetting technology is one of the renewable sources of energy that was devised to address problems regarding global warming, energy crisis, as well as solid waste management. The need for alternative sources of energy has been a sensitive issue for the past years.

II. OBJECTIVES OF THE STUD

The main objective of the group is to design a small-scale (i.e., for experimentation purposes and not for mass production of briquettes) homemade briquette making machine. The specific objectives of the study were:

- To design and construct a hydraulic operated biomass briquetting machine;
- To undertake a performance evaluation of the briquetting machine using residues generated at home.

III. LITERATURE REVIEW

A briquette is a block of compressed biomass or charcoal dust that is used as fuel to start and maintain fire (Grainger et al, 1981).

Briquetting is a mechanical compaction process for increasing the density of bulky materials. This process is used

for forming fine particles into a designed shape. It can be regarded as a waste control measure in the case of production of briquettes from agricultural wastes. However, depending on the material of interest, briquetting can be used to provide fuel source as a preventive measure to many ecological problems. Briquetting is a high-pressure process which can be done at elevated temperature (Zhanbin, 2003) or at ambient temperature (Mohammad, 2005) depending on the technology one wants to employ.

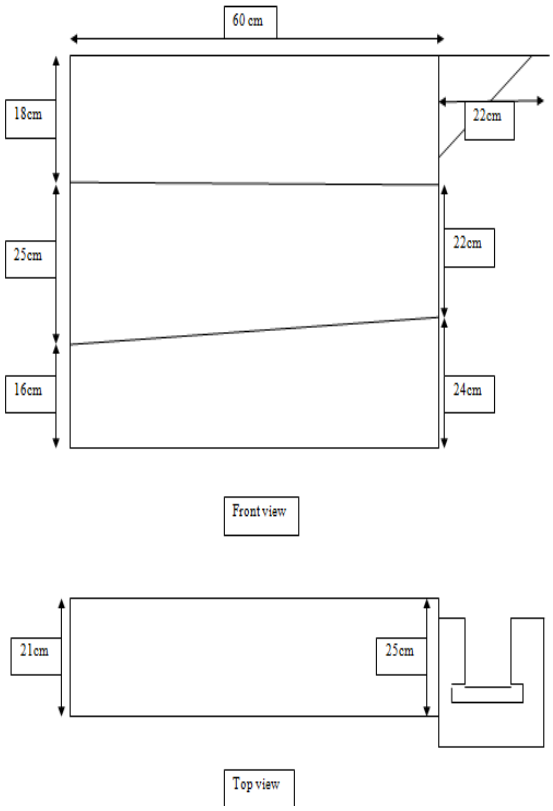
During this process, fine material is compacted into regular shape and size which does not separate during transportation, storage or combustion. In some briquetting techniques, the materials are simply compressed without addition of adhesive (binderless briquettes) (Mangena and Cann, 2007) while in some, adhesive material is added to assist in holding the particles of the material together.

Generally, briquetting process has focused more on the production of smokeless solid fuels from coal and agricultural wastes. There are various techniques which have been used to produce smokeless solid fuel from coal fine. The most common technique is the use of roller press using only moderate pressure and binder. Note that the machines employed for this process are also used to make other kind of 6 non-fuel briquettes from inorganic materials such as metal ores. However, briquetting of organic materials (agricultural wastes) requires significantly higher pressure as additional force is needed to overcome the natural springiness of these materials. Essentially, this involves the destruction of the cell walls through some combination of pressure and heat. High pressure involved in this process suggests that organic briquetting is costlier than coal briquettes.

Various briquetting machines have been designed, ranging from very simple types which are manually operated to more complex ones mechanically or electrically powered. Generally, briquetting operations have developed in two directions, mechanically compression (hydraulic or pistons) and worm screw pressing types.

Common types of briquettes so far in use are coal briquettes, peat briquettes, charcoal briquettes, and biomass briquettes, etc. Most recently, researchers have studied the effect of blending of coal and biomass such as enhancing the properties of coal briquettes using spear grass (Onuegbu et al, 2010a),

Construction of Frame:-



The main part of this project is the angle frame, this made as shown in the above figure. The angle frame is mainly constructed by the Raut Shrinivas, and shortly welded by Ajay Potdar by arc welding. The upper figure shows the front view of the project and below that shows top view of the project.The dimensions are given in the above figure, as per above dimensions the angle frame of High Speed Wood Cutter is constructed.

Fitting of the Shafts into the Pedestal Bearings:-

This is next step; the angle frame is drilled at suitable places by Ajay Potdar by electric drilling machine in workshop of institute. Then the bearings are located and fitted by Krishna Tigile at the drilled places with the help of nut and bolt.

The next step to that is fittings of the polish bar or shafts in the pedestal bearing this is also done by Krishna Tigile. We have failed in the first time during the making of the High Speed Wood Cutter, but second time it is successes.

Arranging of Chain sprocket:-

Next step to that is, fitting the chain sprocket into the pedestal bearing and this is successfully done by Somesh Patil. The lower gears are at 15◦ to the vertical angle frame as the

angle is fitted at 15◦.This is main parts of the project High Speed Wood Cutter because the whole power is transmitted by these chain sprockets.

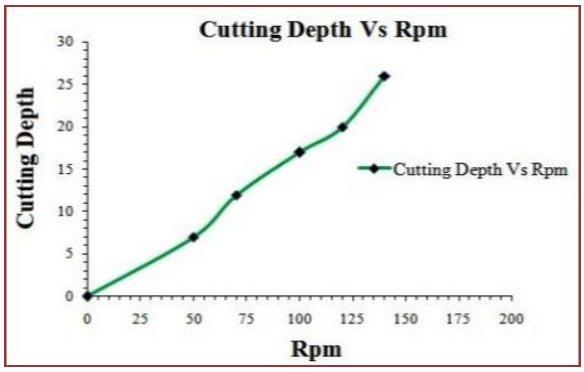
Assembling of different Parts:-

The last step regarding to this project is assembly of different parts. This is done by all us four.This step includes assembly of the sheet metal, helical cutter, pedal rod, pedals, nut bolts at different places. Like this we have completed the project. The cycle frame is fixed with the base mild steel by the process of welding the chain sprocket is connected to the cycle frame and it is connected to the pedals. The one end of the chain is connected to the big sprocket and the other end is connected to the small sprocket which is held in a chain hub. The other end of the hub is fixed with the small chain sprocket .From the other End of the hub another chain is connected to the sprocket and other end is connected to another small sprocket which is held with the circular rod and bearing setup. The circular rod is inserted into the bearing and is welded with the sprocket at one end and with rotating disc at the other end. The connecting rod is connected to the rotating gea at one end and to the rotary cutter at the other top end.

IV. INFORMATIVE CHARTS

4.1 Cutting Depth Vs RPM:

Figure shows the variation of cutting depth with rpm of HSWD. It is observed that the cutting depth increases with the pedal rpm. Experimental result shows cutting depth of about 17 mm can be obtained can be obtained in one cycle of strokes for around 100rpm. The variation in the obtained plot is due to errors in observation and due to power transmission losses.



Advantages

1. No need of electricity.
2.Less effort required to the same wood.
3.No need of skilled worker.
4.Time required to cut the wood is less.
5.Simple in construction and working.
6.Requires very less maintenance.
7.Requires less space and can be placed anywhere in workshop.
8.Capital investment is very small.
9.Motor can be attached to the wood cutter.

Disadvantages

1.Creates noise during cutting of the wood.
2.The required Cutting force for some wood is more so sometimes the effort required to cut this type of wood is also more.
3.It requires more and good lubrication.
4.Backlash in chains or /*s can occur.

Applications

1. Can be used to cut the small as well as large piece of wood.
2. Can be used to cut the wood where electricity is not present.
3. Time required is less so can be used to cut more numbers of wood pieces.

V. CONCLUSIONS

1. Thus the High Speed Wood Cutter is designed tested successfully. The output is verified by cutting the metal pipes, plastics in the cutter by pedaling action. The following advantages were seen such as it is more convenient and easier. It is more eco-friendly. Power is not required.

2. HSWD can be used for light duty cutting operations of plywood.

3. HSWD can be used in remote places where electricity is not available. It is designed as a portable one which can be used for cutting in various places.

4. The ply wood can be cut without any external energy like fuel or current. Since HSWD uses no electric power and fuel, this is very cheap and best.

5. High Speed Wood Cutterhelps to obtain less effort uniform cutting. The results indicate that the HSWD had given better, accurate and faster cuts when compared with hand cutter at different rpm.

REFERENCES

[1] Dharwa Chaithanya Kirthikumar, “A Research on Multi Purpose Machine”, International Journal for

Technological Research in Engineering (Vol.1, Issue.1, ISSN: 2347-4718) (2013).

[2] S.G.Bahaley, Dr.A.U.Awate, S.V.Saharkar, "Performance Analysis of Pedal Powered Multipurpose Machine", International Journal of Engineering Research and Development (IJERD) (Vol.1, Issue.5, e-ISSNdd: 2278-0181) (2012).

[3] Linxu, Weinan Bai, Jingyu Ru, Qiang Li, "Design and Implementation of the Reciprocating Pedal Powered Electricity Generating Device", Advanced Materials Research (Vol.282-283 (2011) pp 735-738.