

Design and Production of Pelletizing Plant for Making Pellets from Forest Wastage

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Abstract

The forest waste like waste leaves and dry grass are available in large volumes. Fuel pellets can be produced from forest waste which can be used as domestic fuel. Other domestic products can be produced from forest waste. It can also be helpful in conserving energy, saving forest trees from felling and keeping the environment clean. This study deals with processing of raw material and fuel pellets can be produced using press tools. Rural people collect the dry leaves and dry grass grinds them with the help of a grinder and then converted into a powder form. This Mixer will mix this powder with the bonding agents. Starch is used as bonding agent obtained from boiled rice. After this mixture of powder and bonding agent is formed in the shape of pellets and logs with the help of press tools or extrusion presses. For doing this experiment a tool has been designed and used.

Keywords: Dry leaves; Pellets; Press tools; Bonding agent; Starch

1. Introduction

Biomass is an important energy source which can be used to generate power more than 50% of countries requirements. India's main economy is agricultural produce. As large quantity of Biomass in the form of straws, husk shells of coconut, dry leaves (bushes). Nearly 350 million tons of forest and agricultural waste is available every year, Biomass can be used as a substitute for coal to the tune of about 200 million tons can produce 17000 MW of power every year which is equal to saving of about Rs.20,000 billions every year. Biomass is available in the form of dry leaves falling from trees, dry grass both are forest waste, agricultural waste, Agricultural waste comprises of rice husk, rice straw, biogases, coconut shell, jute, husk.



Figure.1: Forest waste.

Plenty of dry leaves fall from the trees and plants during autumn and summer seasons. After falling from trees, these leaves spread all over the ground surface and are wasted. In due course, these dried leaves get spoiled and produce bad smell and in turn pollute the environment. Same is the case with dry grass. The waste leaves and grass can be processed and converted into many useful products. These products include: domestic fuel (as wood) and domestic products (substitute of wood).

This project consists of three parts Die, Disc and Punch. The forming process takes place with the help of fly press and the products are made from leaves powder and starch.

Present Problem

The fuel using in our day to day life is nonrenewable source. Some or the other day it will get vanished. To overcome such problems pellets are introduced.

Mainly in villages, the people cut the trees for wood to use them in domestic purposes such as burning them in stoves. This will cause deforestation, to overcome this problem pellet concept is introduced.

By designing simple tools which are used for making pellets by using dry leaves and dry grass is helpful for many people as employment.

Cutting the trees is illegal and the nature gets disturbed by doing so. As the trees reduces oxygen levels gets reduced causing endanger to human.

2. Proposed Solution

Fuel pellets can be made in large scale from forest waste which is available in abundance in the form of dry leaves, dry grass and other waste mentioned earlier. These fuel pellets can be used as an alternative sources of energy. In short millions of tons of forest waste can be converted into useful fuel pellets.

2.1 Objective of the Project

The primary objective of this project is to design and produce the tools for production of pellets

2. To provide information about pellets.
3. Production of pellets from forest waste
4. To provide green environment using pellets as an alternative fuel
5. Produce pellets from forest and agricultural waste.

3 Methodology

Pelletization is a process of producing the pellets with the help of compression and molding tool. This study explains a processing of forest waste and production of the pellets and logs using press tools. The dry leaves and dry grass are ground with the help of grinder which converts it into powder form.

This powder is then mixed in a mixer with the bonding agents. These agents can be fevicol and liquid (starch) obtained during boiling of rice. The pellets are formed from the mixture of powder and bonding agent, with the help of press tools. For experimental purpose a tool has been

designed and used. This consists of three parts Die, Disc and Punch. The forming process takes place with the help of fly press and the products are made from leaves powder and starch.



Figure.2: Powder from dry leaves.

It consists of the following tools:

3.1 Grinder

In this project simple tool is designed to produce the pellets. These tools are operated by manually and anyone can use these tools i.e it is not required knowledge to operate this tools. The collected forest wastage is crushed by using grinder. Grinder body is made of aluminum. The operator has to rotate the handle, the blades rotates accordingly. This is nothing but conversion of axis of rotation using bevel gear mechanism. Bevel gear is attached to handle and blades with two individual normal gears. When the operator rotates the handle the blade rotates. Figure of grinder is below:



Figure.3: Blades in grinder



Figure.4: Bevel gear in grinder



Figure.5: Grinder with handle



Figure.6: Collection of powder after grinding.

3.2Punch and Die tool

After collecting the powder, it has to be mixed with starch and this mixture is to be put in a tool which is designed. This designed tool consists of a punch and die. A lead screw is used to rotate the handle

When the handle is rotated in clockwise direction the punch plate goes towards the die plate and presses the mixture. In result the mixture takes the shape of holes which are present on the die and comes out. These collected wet pellets are dried in sunlight and then can be used for fuel purposes.

The following figure shows punch and die tool.



Figure.7: Punch and Die tool.



Figure.8: Die Plate with holes (Dia of 10mm).



Figure 9: Punch plate attached to lead screw.

3.3 Fly Press

Since the tools are operated manually, the strength attained in the pellets will be less. To reduce this problem we are using fly press in this work. The fly press comprises of wheel which is attached to lead screw. Other side of the lead screw is attached to punch plate. So when the wheel is rotated clockwise, the punch plate hits the tool which we have placed. The pellets attain the shape of die plate which is in the tool. By rotating the wheel anticlockwise the punch plate detaches from the tool and the tool can be removed to collect the pellets.



Figure.10: Fly Press at pressed position.



Figure.11: Formed pellets using the tools.

3D Views of the tools parts.

Modeling of the tools has been done with the help of modeling software CATIA.

The following figures are models of die plates.

Die plate

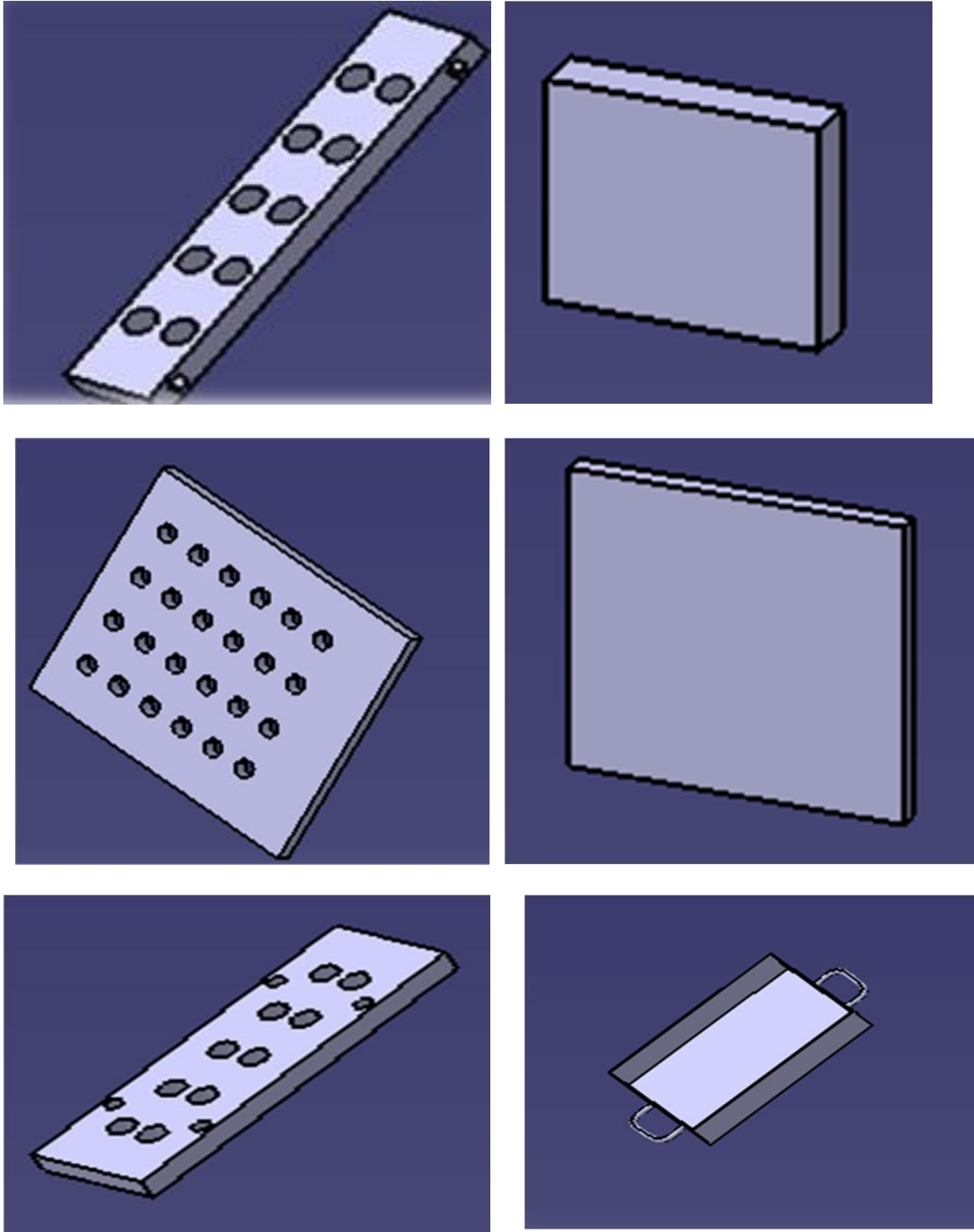


Figure. 11:3D views of Press tool parts.

Conclusions

By making the pellets will helps in conserving energy which also help in saving forest trees from felling and keeping the environment clean.

As the forest waste is available cheap.

These fuel pellets can be used in stoves which look like traditional domestic stoves.

Scope for Further Work

The work can be extended using other bonding agents and rolling process to produce other useful industrial/domestic products. The dry leave powder can be used for making pulp in paper industry and as reinforcement material for plastic products.

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