

Modern Bio-Mass

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Abstract: The main objective in this thesis is usage of waste papers as biomass and to reduce the emission of greenhouse gases at the time of ignition. In this experiment the Biomass act similar to wood because the biomass absorb the water for 5 days in the process as explained below. We describe the study about adsorption capacity of biomass and the behaviour of paper at that absorption, compression and ignition of Biomass is explained. In this experiment the newsprint grade type of paper which consist of organic compound of greater than 95 percent, inorganic compound of less than 5 percent and camphor is used. Camphor is used to increase the ignition rate of biomass

Keywords: Biomass, Ignition Rate, Compression

1. Introduction

We are surrounded by many energy resources like renewable and nonrenewable example: wind, tidal, hydro-electric, solar, coal etc.

1.1 Biomass

Biomass is an organic matter which had been extracted from living organisms like plants, animals and humans etc. The Biomass is often used as an energy resource. It produces electricity, heat and many other forms of energies. It is not used as food. It can directly produce energy by combustion to produce heat and indirectly like bio-fuel and etc.



Figure 1.1: Paper Pieces

1.2 Paper Composition

The chemical composition will depends on type grade of paper. Mostly the grade of paper consists of organic and inorganic composition of materials. Organic composition consists of materials like cellulose, hemicellulose, lignin and various components of lignin and may be around 70-100 percentage of water. Inorganic portion consists of mainly filling and loading materials such as calcium carbonate, clay, titanium oxide etc. and may be around 0 to 30 percentage of paper. [1]

Inorganic	Organic	Type/Grade of Paper
Less than 5 percentage	Greater than 95 percentage	Newsprint
Less than 5 percentage	Greater than 95 percentage	Corrugated (Media & Liner)
Between 0 to 30 percentage	Between 70 to 100 percentage	Writing, Printing, Copying and Book Paper
Less than 2 percentage	Greater than 98 percentage	Hygiene Tissue

Here in this experiment, a newsprint paper which consist of organic matter greater than 95 percentage and inorganic matter may be less than 5 percentage had been used.



Figure 1.2: Newspaper

1.3 Camphor

Camphor is a flammable, transparent solid with strong aroma. The chemical formula for camphor is "C₁₀H₁₆O". Camphor is an organic compound of penetration. The musty aroma is used for many centuries as a component of incense and for medicinal purpose. Modern uses of camphor have been as a plasticizer for cellulose nitrate as insect repellent particularly for moths.

C ₁₀ H ₁₆ O	Chemical Formula
152.24 g-mol ⁻¹	Molar Mass
White, Translucent Crystals	Appearance
Fragrant and Penetrating	Odour
175 TO 177 Degree Celsius	Melting Point
209 Degree Celsius	Boiling Point
4 MM hg	Vapour Pressure
~250 g dm ⁻³	Solubility In Acetone



Figure 1.3: Camphor

1.4 Ignition

"The action of keeping something on fire or the burning of material is called Ignition". In this test we are considering the rate of ignition of one material with respect to the rate of

ignition of other material. The ignition temperature for newspaper mix with water is 230 degree Celsius. Ignition temperature for wood is 120 degree to 150 degree. But here we compare the time of ignition of the normal dry paper, briquettes of paper which we had been done by us and wood [2].



Figure 1.4: Ignition

1.5 Compressor

Compressor is a device which is used to compress the biomass for removing the water content present in it. It has cylindrical container in which biomass is filled and also a movable piston which move horizontally. Piston compresses the biomass, which is controlled by a lever. As the lever is pressed continuously the biomass is compressed by piston and water is drained. The lever is operated by a spring action. Washers are used in cylinder on either sides of the biomass.



Figure 1.5: Compressor

“The Below Diagram show the Briquettes that form after the Compression”



Figure 1.6: Biomass briquettes

2. Procedure

2.1 Absorption of Water by Capillary Pressure

Under this pressure liquid moves into the paper. Capillary pressure is positive and contact angle between solid phase and liquid phase is less than 90 degree. In this state capillary pressure pulls the liquid phase into Pore system. The penetration of drops of liquid in a porous substrate is often described as a surface tension driven flow. This is the reason why the paper absorbs water. Here we used newspaper, water, fire and camphor.

Day 1:

Take the pieces of Newspaper and dip in water to make all the dry paper pieces wet and leave it undisturbed in a cool and dark place until day-2.



Figure: Day1

Day 2:-

Stir the mixture of paper and water so that the paper will absorb the water and become thicker day by day



Figure: Day 2

Note:

Make a note on changes in the composition of paper and water

Day 3 & Day4:

The same reaction will occur in day 3&4, in day while stirring you will observe that water content is less compared to day 1&2 and in day-4 water will get completely absorbed by the papers.



Figure: Day 3



Figure: Day 4

Day 5:

Take the compressor and fill it with paste of papers and the paste of papers will get Compressed and complete water will be drained. Then the biomass is taken out from the compressor. The compressed biomass form a brick structure as shown in figure.



Figure: Day 5

This compressed biomass is dried in sun for two days. Now the biomass is ready for combustion. We can see that the ignition time for compressed modern mass is more compared to the normal paper.

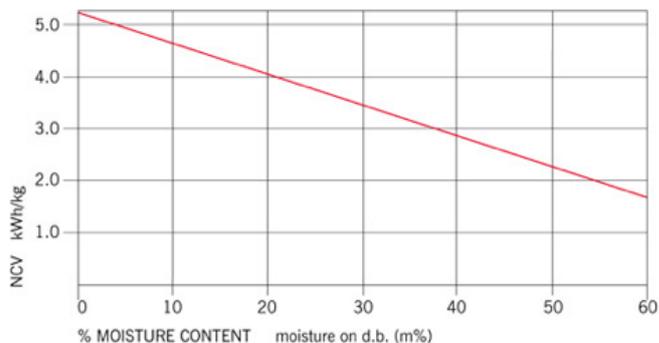
2.2 Compression of biomass

Compressed biomass is called briquettes. Briquettes are better than loose biomass. This compression allows them to burn longer than loose biomass. So we can say that ignition time of briquettes is depends on the compression.

“Compression is directly proportional to ignition time”

2.3 Drying of biomass

Drying of biomass is done for 2-3days in the experiment this is because it increases combustion efficiency and steam production. As the moisture content decreases thermal energy increases.



2.4 Ignition Process

“The action of keeping something on fire or the burning of material is called Ignition”

Reaction that takes place during burning is
 “ $C_6H_{10}O_5 + O_2 \rightarrow CO_2 + H_2O$ ”
 Cellulose

If smoke occurred is less, the above equation is example.
 “ $C_6H_{10}O_5 + O_2 \rightarrow CO + CO_2 + H_2O$ ”

If the smoke occurred is more, the above equation is example.

When paper pieces is kept in water, In the wall of wood fibre, water is held in microporous gel of hemicelluloses and lignin which is distributed as fine platelets within a cellulose skeleton consisting of much distorted lamellae . As lignin and hemicelluloses are removed by peeping, the amount of water in the wall increases as water fully occupies the space previously shared with these components. [2]

As we already know the ignition temperature of paper so in this journal we are finding the ignition time of the biomass of paper.



Figure 2.4: Ignition process

As per our experiment the observed ignition time obtained

by biomass is:-“**14.64**”seconds.

2.5 Importance of Biomass

- It is used to replace the fossil fuels and coal for energy production.
- They add less pollution.
- Renewable energy and will not add greenhouse gases to atmosphere.
- Application can be used from boiling of water to power turbines.
- Cheaply available.

3. Conclusion

As per our experiment the observed ignition time obtained is:-“**14.64**”seconds. Main theme of our experiment is to save the nature from pollution caused by fossil fuels or coal by substituting the biomass at those places.

“By using biomass the wood can be saved
By that the trees can be saved
By that the forest can be saved
By that the groundwater can be saved
By that the crops can be saved
By that the human life can be saved
By that the whole world can be saved.”
So by using biomass save nature and the nature saves you in return.

References

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