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Mathematical and Evaluation of Power Generation of Agriculture based Biomass Species and Coal Biomass Mixed Briquettes

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Abstract - *The power utilization is increasing day by day due to advancement in latest technology. Which is very beneficial for our daily life working life. To make necessary condition in addition to the early source of power such as coal, water, petroleum etc a other sources of energy should be searched for getting more benefit and more efficient ways of producing energy should be devised. Power generation from biomass become more benefit, more attractive way for energy generation due to their high energy potential and less pollutants.In this present proposed work it deals with to find out proximate analysis of different kinds of components such as leaf ,woods, nascent branch and energy content of different components of same items such as Arhar, pigeon pea, and peanut , ground nut shell and their power generation potential and also requirement of land for plantation. There biomass components individually mixed with coal sample in different – different ratio, and also their proximate analysis has done and their value are determined to find out power generation in best suitable mixture. Evaluation has been made for power generation potential of these biomass species and coal biomass mixed briquettes for a small thermal power plant on decentralized basis.*

Key Words: **Biomass, coal-biomass briquette, proximate analysis, calorific value, energy value**

1.INTRODUCTION

As we know that fossil fuel is the very most important source of power generation in all over the world which is very most important factor in our daily life. From fossil fuel approximate 85% energy is supplied to the world's population. Fossil fuels arte of great important because they can be burned and producing an amount of energy per unit mass. Mostly a coal is used as a fuel recorded history and coal was run furnace for the smelting of metal ore. The sharing of fossil fuel is more than 90% in India. The demand of energy is increasing day by day because of increasing industrial area, because of population and also it is a non-renewable source of energy. The example are coal, oil and natural gas are most important source of supply energy. More than 50% of piece of coal is weight must be from fossil plant. There are three main fossil fuel coal, petroleum and natural gas which are using in our daily life. Coal is very cheap and it releases a lot of pollution when it burned in furnace in anywhere of environment. The fossil fuel have high percentage of carbon and include petroleum, coal and natural gas.

According the 2018 the world main primary source of energy such 34% petroleum, 27% coal, natural gas 24% are consisted. But the fossil fuels are limited non-renewable source of energy and serious environmental concern, human health hazards. It producing 36 billion tons CO_2 in environment and cannot use it for a long time or long life in the world. Because it is in peak usage and it cannot be stored in long time.

1.1 LITERATURE REVIEW

Werther et al.,2000[1], has been explained the proper use of biomass to give incomplete substitution of fossil fuels has an extra importance as concerns global warming since biomass combustion has the potential to be CO2 neutral. This is particularly the case with watch to agricultural residues or energy plants, which are occasionally planted and harvested. During their growth, these plants have detached CO2 from the atmosphere for photosynthesis which is released again during burning.

Close the Both plant species (Gulmohar and Cassia tora) indicated nearly the comparable proximate investigation results for their parts, the debris substance being more in their leaves and unpredictable issue content less in Cassia tora wood and leaf. Energy estimations of coal blended Gulmohar biomass part were discovered to be tad higher than that of coal blended Cassia Tora biomass segment. Blended proportion of Both biomass in with coal (in four diverse proportion) additionally demonstrated a similar proximate examination results, the debris substance being more when 95% coal blending in with 5% biomass and unpredictable issue is more when 80% coal blending in with 20% biomass.

Raghuvansi,2006[2] described that with the help of Combustion it converts coal into useful heat energy, but coal is too a part of the course that engenders the greatest environmental and health concerns which also harmful for our health.

TusharJash (2008)[3], Estimated, West Bengal is an agricultural based state in Bharat there are two main category of biomass residue that is agriculture and forest

residues in west Bengal in Bharat. Biomass residues generated approximate 80% comes from agriculture.

Pratik N.Sheth, BV Babu (2009)[4],It described a process in which with the help of fractional combustion change the solid carbonaceous fuel into combustible gas is known as gasification after resulting gas is more reliable and flexible in its use is known as producing gas than the solid biomass,

Changjianghuang,(2013)[5], described the mathematical recreation model is proposed by the attributes of the biomass briquette energizes, which includes two principle territories of interest.

1.2 PROBLEM DEFINITION

- Non renewable source of energy is not long time consuming source of energy and it cannot be replaced or is replaced slowly and gradually by only natural process.
- The burning of fossil fuels has a harmful effect on the environment and also responsible for the global warming and climate change.

2. OBJECTIVE OF PROJECT

- Firstly main objective of this thesis work is to select the non-woody biomass and its species and mixed with coal to make briquette in proper ratio.
- Find out the proximate analysis of this project work.

3. EXPERIMENTAL WORK

In this project work experimental procedure is done after selection of materials for getting a better result.

1- First of all select the material for experiments such as coal, non-woody biomass etc.
2- Selected material cut in to different pieces or small parts of equal size.
3- Selection of coal from any other mines for further procedure.
4- After selection of material prepare the Briquetted material.
5- Then find out the moisture contents or water contents
6- Find out the ash contents for further process.
7- Determine the volatile matter
8- Determine the fixed carbon contents
9- Then find out the proximate analysis

Finally find out the calorific value from bomb calorimeter with different steps. There are different apparatus for bomb calorimeter such as Sample oxygen bomb calorimeter, fuse wire thermometer, 2-3 liters of water, supply of oxygen, power source and stop watch.

3.1 MOISTURE CONTENTs

The water contained in materials such as soil, rock, ceramics and non-woody biomass material is knows as moisture content. In general terms we can say that amount of water present in others material.

Moisture content in % = (Weight before – Weight after)x100 / Weight after

Determination of Ash contents

Determination of ash contents is part of the proximate analysis for evaluation. As contents is most important parts of the non woody biomass experiments. One gm. (1 gm.) of -72 mess size (air dried) was in use in a shallow silica disc and kept in a stifle furnace maintained at the temperature of 775 degree Celsius.

Determine of volatile matter

When a sample is heated at a temperature of 900 degree Celsius for a period of 8 days due to this action a volatile matter is find out as the loss in mass because of less moisture which is experimented. One gm (1 gm.) of -72 mess size (air dried) powder of the on top of supposed materials was taken in a volatile material crucible (cylindrical in shape and made of silica).

Determination of Fixed Carbon

Fixed carbon is the strong burnable buildup that stays after a coal molecule is warmed and the unstable issue is ousted. The fixed carbon content of any fuel is determined by subtracting the sum of percentages of moisture, volatile matter, and ash in a sample from 100.

%fixed carbon =100-(%moisture+%Volatile Matter+%Ash content)

Calorific value

As we know that the energy contained in a fuel or food, wood, non-woody biomass found by measuring the heat produced by the complete combustion of a specified quantity of it. This is now usually defined as in joules per kilogram. Also we know that calorific value is the total energy released as heat when a substance complete combustion with oxygen. In this project work calorific value is determined in non-woody biomass for producing the power generation, for proximate analysis etc.

4. MATHEMATICAL CALCULATION AND RESULT

Energy calculation for pigeon pea biomass

The total energy from one hectare of land = (2907+1224+653+193+817) x 10=5704x10^3 kcal

Now there is need of thermal generator to convert the energy from one form to other i.e. electrical energy.

Mixed briquette as fuel =30%,

And mechanical efficiency of power plant = 85%

Energy value of 30% thermal generator= 5704 x 10^3x0.30
= 1712x10^3kcals

=1990.2 KWh

Now power generation at 85% =1990.2x 0.85
= 1691.67 KWh/ha

As we know that power plant has capacity to generate 20000 Kwh/day.
Now for yearly = $73x10^5$ KWh
Land required for supplying electricity for the whole year = $73x10^5/1691.67$

5. CONCLUSION AND DISCUSSION

In this project work two types of non-woody biomass are selected such as groundnut shell and pigeon pea for experiment to find the value of proximate analysis and calorific value ,ash contents, these experiment are done on the each species such as stump, bark, branch, leaf, seed were performed. In this project work also find the how much power can be generated and how much land required for plantation for each of these species. There is different conclusion from the present work such as,

- In both the Non-woody biomass showed the similar proximate analysis result for their species such as Seed, Bark, Branch, Leaf, stump.
- Result show if percentage of groundnut shell increase in coal biomass briquette then calorific value and ash content decrease and volatile matter increase.

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