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Mathematical Evaluation of Non-Woody Biomass Species Mixed with Coal Biomass Briquette

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Abstract - *As it is clear from result that both the biomass species has fewer ash content and high volatile matter when the coal is, mixed in the proper ratio of 80:20 and different element of pigeon pea has higher calorific value as compared to groundnut shell. After selected coal the components of pigeon pea has a higher calorific value , due to that when it mixes with coal calorific value of mixture enhance as the amount of pigeon pea biomass increase in the mixture of coal-biomass briquette. biomass mixed briquette is used as fuel for power generation in the ratio of 80:20 it is establish that it requires 197.91 ha (in case of use of coal-pigeon pea briquette) and 891.33 ha land (in case of use of coal-groundnut shell briquette) which is more practical because it reduces the dependence on agricultural residues and also ground requirement for plantation.*

***Key Words*: Calorific value, Energy value, Biomass, Coal-biomass briquette, proximate analysis.**

1. INTRODUCTION

After study the drawback of fossil fuel regarding health hazards, pollution, and non long life available of fossil fuel. Due this reason it has become important to explore and develop renewable energy source of energy to reduce much dependence on conventional source of energy. In this project work biomass non-wood energy is used for power generation and proximate analysis .it become more attractive way of energy generation to improve high energy potential and less pollutions. With utilization of biomass in power generation, it can solve the vital issue of atm. Pollution, Waste land, power losses. And it can be stored considerable period of time without any difficulty. Beside electricity supply to the national power grids, biomass offers giant opportunities for decentralized power generation in rural area. It is observed that the decentralized power generation system reduce peak load and maintenance cost of distribution network. Present work deal to determine the proximate analysis, calorific value, energy value of two selected biomass species and mixed biomass briquette to find best suitable ratio for power generation and land requirement for plantation.

1.1 LITERATURE REVIEW

Tripathi,P. (2015) [1],Explained that because of facing through the countless number of crises centered on depletable energy sources, mankind is trying its best to squirm itself out of the situation through greater reliance with the sources of energy which is not depletable.

Gulab Chand Sahu,2013[2], Presented work, by mixing the non-coking coal from Orissa mines and related biomass species in different ration briquettes was prepared.The objectives have been to inspect their energy values and power production potential.

Chauhan Suresh,2012[3],talked about that around 40.142 Mt y_1 of the all out harvest buildup is produced from different major and minor yields, of which around 71% is burned-through in different structures, bringing about 29% as a net excess accessible for power age. Essential excess and net overflow crop buildups for power age potential were assessed in each area Sangrur, Ferozpur, Amritsar, Patiala and Ludhiana are the significant excess biomass possible locale, while Rupnagar, Nawashahar, Hoshiarpur, Fatehgarh Sahib Faridkot and Kapurthalla are least overflow biomass expected areas inside the state. It has been assessed that around 1.510 GW and 1.464 GW of intensity in the state can be produced through fundamental excess and net overflow biomass individually.

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, in this paper to carry out the gasification practical by using downdraft biomass gasified with the waste generated while making furniture in carpentry section. The sesame wood or rose wood is used in making the furniture and wastage of sesame wood and rose wood used as biomass materials.

S.C. Bhattacharya (2009)[5],described that promoting renewable energy in India has implicit great importance in recent years in view of high growth rate of energy consumption, high share of coal in domestic energy demand, deep confidence on imports for meeting demands for petroleum fuels and instability of world oil market. A number of renewable energy technologies (RETs) are now well reputable in the country.

1.2 PROBLEM DEFINITION

- It is time consuming and dangerous and takes billion of years in their formation.

- By using woody biomass for the energy production and as a feedstock for firms and affects air quality, forest health and other natural.

1.3 OBJECTIVE OF PROJECT

- In proximate analysis find moisture content, ash content, volatile matter, fixed ratio, Calorific value also.
- Mixed these biomass components separately with coal sample in different-different ratio.
- Classification of Coal -Biomass species for energy values.
- Estimation of power generation plantation for small group of village for use domestic purpose.

2. MATHEMATICAL CALCULATION AND RESULT

In this project work a proximate analysis is done with the selected plant. It is very most important to find out moisture contents. Ash contents and volatile matter of fuel energy source for getting the value of power generation potential in this project work. After study of proximate analysis it gives an important approximate idea about the energy value and pollutant emission during combustion. Generally agriculture based woody and non woody biomass has large amount of free moisture which is very most important point of view. This study is done to decrease the transportation cost and increase the calorific value which must be removed for the present study. In the plant the selected species require time to bring their moisture content in to equilibrium with atmosphere was found to be in the range of 25-30 days during summer season ie.40-42 degree Celsius with humidity 15-25% for proximate analysis.

In this project work some non-woody biomass such as Groundnut shell, pigeon pea and their Contents are selected for the project work. And briquette is made after mixing with coal in proper ratio. The briquette process is the conversion of agriculture waste into uniform shaped briquette that is easy to use, transport, and store. In this project work some non-woody biomass such as Groundnut shell, pigeon pea and their Contents are selected for the project work. And briquette is made after mixing with coal in proper ratio. The briquette process is the conversion of agriculture waste into uniform shaped briquette that is easy to use, transport, and store.

Table -1: Proximate analysis and calorific value of groundnut Shell, Different component of pigeon pea and coal (air dry basis).

Component	Proximate analysis in %				Calorific value (kcal/kg)
	Moisture	Volatile matter	Ash	Fixed carbon	
Ground nut shell					
Shell	6.5	67.0	11.0	20.1	3751.60
Pigeon pea					
Stump	9.2	65.0	9.7	14.2	5816
Branch	11.0	69.0	7.6	13.6	4012
Leaf	9.2	69.0	10.2	16.2	5632
Bark	5.0	75.0	8.3	13.2	3846
Seed cover	11.0	66.0	11.0	16.0	4031
Coal					
Mines	8.1	22.3	42.3	26	4653

Table 2- Proximate analysis and Calorific value of Coal and ground nut shell mixed briquette in different ratio

Coal-biomass ratio	Proximate analysis wt.%				Calorific value(kcal/kg)
	Moisture	Volatile matter	Ash	Fixed carbon	
95:05	8.80	23.6	39.2	28.1	4207.2
90:10	8.72	25.3	38.6	27.6	4100.2
85:15	8.45	25.9	37.2	26.3	3995.8
80:20	8.24	27.6	36.1	25.4	3921.6

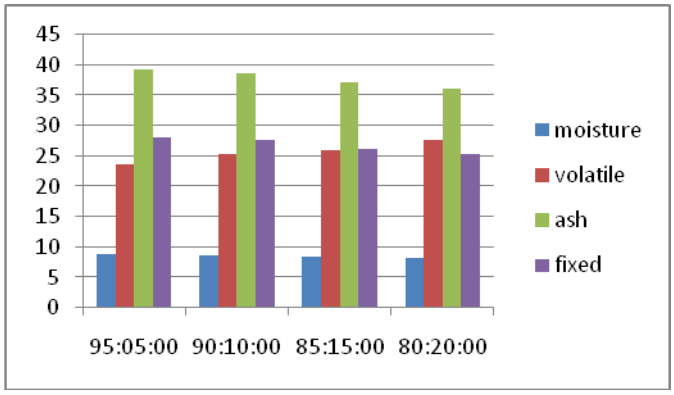

Table 3 – Total energy contents and structure of power generation for pigeon pea and groundnut shell

Components	Calorific value(Kcal/t)	Biomass production(t/ha)	Energy value (Kcal/ha)
Seed cover	**4081 x10³**	**0.20**	**817 x10³**
Branch	**4081 x10³**	**0.30**	**1224 x10³**
Leaf	**5630 x10³**	**0.10**	**563 x10³**
Bark	**3846 x10³**	**0.05**	**196 x10³**
Stalk	**5815 x10³**	**0.50**	**2907**

			$x10^3$
Groundnut shell	**3654.59 $x10^3$**	**1.341**	**4900.80 $x10^3$**

3. CONCLUSION AND DISCUSION

In this project work two types of non-woody biomass is selected for getting a better result there are some outcome points below such as -

1- There are four different ratio such as 80:20, 95:05, 90:10, and 85:15 among the four ratio the 80:20 give less ash content and higher volatile matter and energy value compared to other different ratio.
2- Energy value of coal mixed pigeon pea biomass were found little bit higher than a coal mixed groundnut shell biomass.
3- The study is positive in the exploitation of non-woody biomass species for power generation.

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