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Alternative Fuel For Power Plant

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ABSTRACT
The highly increasing scarcity of conventional fuel (coal) has lead to the search of an alternative fuel. There is large variability in crop residues generation and their uses in different regions of country depending on the cropping intensity, productivity and crops grown. India is a biomass rich country. Presently, it is used mostly by the rural population. Total share of biomass in total primary energy usage is 42 % in India, but it is used by more than 76% of the population. Efficient use of Biomass can lead to socio-economic development. This paper shows a fuel made from cotton stalks to run 100 MW power plants throughout the year and also it shows the mathematical calculations for the fuel supply to power plant. We can reduce the power generation cost and also we can forget power cuttings.Basically the calorific value of cotton stalk and coal nearer to each other. By carbonization process we are increasing the calorific value of cotton stalk. The cotton stalks having zero percentage Sulpher
Key words: 100 MW[1], Biomass[2], calorific value[3], cotton stalk[4], crops[5]

I. Introduction

In industrialized countries, the use of crop residues for energy production has been propagated as a substitute for fossil fuels. Plants have always been the most important resource for humanity, not only for food and animal feed, but also for other important biomaterials, such as wood, oils, fibres, and energy.Plant cells produce biomass from simple chemical building blocks in the air and the soil,including carbon dioxide, nitrogen and water, using the sun as a free energy source. Fossil resources – limited in availability and a major source of greenhouse gas emissions – will need to be replaced with renewable resources. The limited availability of fossil fuels and the growing awareness of the detrimental environmental consequences resulting from greenhouse gas emissions have reinforced the importance of crop residues as an energy resource in developed and developing countries. But the major problems in use of crop residues as energy source relate to their thin spread over large area after crop harvest and low bulk density. The low bulk density creates problems in handling, transport and storage. The stalks contain a substantial percentage of pith cells which, together with the dark-colored outer bark, create problems in both pulping and papermaking processes.

II. Bio Mass

The potential of an area & formulate policies for the same requires proper understanding of the availability of the same. An unique knowledge networking institution – Technology Information, Forecasting and Assessment Council (TIFAC), worked under the Department of Science & Technology (Government of India) & carried out the required study. In the survey carried out both quantitative (actual production of biomass in India in terms of quantity) & qualitative (quality of the biomass in India) aspects were focused. The overall assessment for the surplus biomass resources was based on estimation of the quantity of crops produced, crop residues generated and their existing utilization patterns/practices in the area. The major crop producing states according to the survey are Andhra Pradesh, Assam, Chattisgarh, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Orissa, Punjab, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal, etc. (not necessarily in the order of production).

Biomass is used as an animal feed. It can be used for making fertilizers i.e. compost. It is widely used as a household fuel in rural areas. It can also be used to make fuel for domestic and industrial use. Biomass can be converted to various other forms. Biomass can be converted into energy directly (in the form of heat or electricity) or to other forms such as liquid biofuel or combustible biogas. It can also be converted into a wide array of value-added products.

Fig:2.1 cotton stalks

Table: 2.1 status of area wise availability of cotton stalks in India characteristics of crop residues

state	Area (million ha)	Availability of Stalks (million tones)
Andhra Pradesh	1.213	3.2
Tamil Nadu	0.241	0.53
Karnataka	0.517	1.2

Table: 2.2 calorific value of different fuels

Fuel	**Calorific value** KJ/Kg k
Coal	20000
Biomass	
Rice husk	12400
Cotton stalks	19700

III. Elemental analysis cotton stalk

The availability of cotton stocks in India is about 31 million tonnes of cotton stalk is generated in India every year. Most of the stalk produced is treated as waste though a part of it is used as fuel by rural masses. The bulk of the stalk is burnt off in the field after the harvest of the cotton crop as pointed out earlier. Cotton stalk contains about 71% holocellulose, 26% lignin and 3% ash.

Table: 3.1.cotton stalk element properties

Crop Residues	**Cotton stalk**
Element	percentage
C	51.00
H	4.90
N	1.00
Na	0.09
K	0.61
P	0.08
Mg	0.43
Ca	0.12
SiO2	1.33
O	43.87
S	0
Ash,	3.10
Calorific Value, MJ/kg	19.4

IV. Collection of cotton stalk

Cotton is a seasonal crop harvested in India from august to march. Cotton stalks which are available only between January and July will require storage over several months to ensure adequate raw material for carbonization process.

V. Carbonization of cotton stalk

5.1. Raw Material

The cotton stalks used in this work were of the type Teja. The stalks were cut into pieces about 3-4.5 cm in length by cutting machine. No debarking was used.

Fig: 5.1.1. Pieces of cotton stalk

Carbonization means Heating of bio mass in absence of air .Due to carbonization we can improve the properties of the cotton stalk and also we can reduce the moisture content, ash content and other residual gases. Generally the carbonization temperature is 450-750^{0}C, 8-15 hours.

After carbonization one ton of cotton stalk converted into 280 kgs of carbonized cotton stalk and 300 kgs of ash remaining things added into atmosphere in the form of moisture and gases. In above mentioned 3 states total production is 4.93 million tons.

Therefore 4.93Million tons cotton stalk converted into 4.93 X 10^6 X 280 =1380.4X10^3 tons of carbonized cotton stalk.

5.2. After carbonization at 700-850^0 C

Table: 5.2.1.cv of fuels

Fuel	**Calorific value**
Rice husk	15.3-17.2 MJ/kg
Cotton stalks	25.2-27.4 MJ/kg

VI. Fuel requirement of power plant

Since carbonized cotton stalk has a heat value of 27400 kJ/kg, for producing one kw.hr we require (10765 / 27400) 0.392 kg of carbonized cotton stalk. This translates to (0.392 x 100 x 1,000), 39200 kg/hr (39.2 T/hr) of carbonized cotton stalk for an output of 100 MW. So actually we can produce.

For one annual year we need 39.2 X 24 X 365=343392 tons.
The availability is 1479000 tons.

The difference 1380400-162060= 1218340 tons reaming.

Even though we are losing few sticks in transportation, few in storage and few in other manner but we can run power plant continuously without shut down. Because we have excess amount fuel then our requirement. If we are considering for low calorific value the excess amount also will be there.

VII. Conclusions

If biomass is focused it can act as a game changer for the rural economy.The power generation from crop residues would make the rural sector self reliant which will lead to higher production and productivity. The use of local resources would also enhance the employment opportunities and income in the rural area.accordding to my opinion only the carbonization process little bit expensive. Remaining process is naturally occurring or with less expensive. For 100 MW power plants they need carbonized cotton stalk (39.2 Tons/hour). So the total fuel required for one year is 343392Tons/year. The cost of generation is very cheap and also it won't cause acid rains. Because the cotton stalks not having Sulpher content. The advantages of using crop residues as energy source are economic and environmental.

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