International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 03 | Mar -2017 www.irjet.net p-ISSN: 2395-0072

Electricity Production by Waste Materials

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Abstract - *The main aim behind this project is to reduce the pollution, and recycle the wastage and reuse them and finally to produce the gas from waste. For producing the electricity we are using the process of converting the biomass energy into the gas and it will be converted into electricity. In the sense here the phenomenon of biomass power and this biomass power will be converted into electricity. And by using this reduce the pollution and also reduce the effect of global warming.*

Key Words: **Gasifier, Gasification,Gas Filter, Motor, DGset**

1. INTRODUCTION

In the present world, electricity is very necessary. So to generate electricity we use many fuels like coal, gas, diesel, uranium etc. These all fuels are in limited quantity. Which, we could up to 70 to 80 year. These fuels are use in deferent power plants to generate electricity. EX. In thermal power plant - coal, nuclear power plant - uranium, in gas power plant - gas and in diesel power plant - diesel is used as fuel to generate electricity.

The cost of these plants is high. Like maintenance cost, capital cost installation cost, running cost etc. So the generate electricity from this plants are also costly. These fuels are polluting the environment which affect on the health of human being and also increase the effect of global warming.

Wood or other dry biomass is converted into a combustible gas and then into electricity via a generator set – a perfect solution for remote rural areas with a lack of electricity but an abundance of shrubs, straw, rice and peanut husks or other forms of biomass.

This technology, known as biomass gasification, has been well known for more than a hundred years. In light of rising prices of fossil fuels in 2008 and the debate about climate change, this technology has again come under consideration as a renewable energy source in rural areas. However, converting biomass to electricity is not as easy as some manufacturers would like to make us believe.

2. GASIFIER

Gasification is a thermo-chemical process, which convert solid carbon as material/fuel, waste material in to useful gas clean gaseous fuel called **PRODUCE GAS.** It is not worthy that this technology completed almost a century of a proven use all over the world.

This technology has been approved by all the organization of the world, like **UNO,UNDP,DOE,USEA,FAO,MNS** of **GOL** and the concerned government agencies of every nation. many under-development and developing countries have declared incentives to encourage this form of renewable & cleaner technology for energy generation.

Worldwide there are different types of gasifier working according to end use.

2.1 Up draft Gasifier

Mainly for small & medium thermal application

2.2 Down draft Gasifier

Mainly for small power generation.

2.3 Cross Draft Gasifier

Mainly for large power generation.

2.4 Fluidzed bed Gasifier

For more than 10MW thermal application & big power plant.

Mainly we are working with Downdraft gasifier which is suitable for small power generation.

Downdraft Gasification technology is robust and ideal for adaptation different types of fuel and not sensitive to different feed stock and also quality of fuel. Following reaction take place in Downdraft Gasifier.

Table -1: Reaction Take Place In Downdraft Gasifier

Combustion	$C + O_2 = CO_2 + heat$
Water gas	$C + H_2O = CO + H_2 - heat$
Water shift reaction	$CO + H_2O = CO_2 + H_2 + heat$
Boudouard reaction	$C + CO_2 = 2CO - heat$
Methane reaction	$C + 2H_2 = CH_4 + heat$

3. Chemical Composition of Producer Gas

The Gasifier can convert any type of Biomass/coal into Producer gas. The chemical composition of producer gas is as under. The gas composition may slightly differ depending upon the fuels

Table-2: Proposition Of Gas

CO (Carbon Monoxide)	20±2 % (App.)
CH_4(Methane)	03±1% (App.)
H_2(Hydrogen)	18±2% (App.)
CO_2(Carbon dioxide)	06±3% (App.)
N_2(Nitrogen)	50±5% (App.)
Condensable heavy hydro Carbon (tar)	Depends on fuels
C.V. of Producer gas	1000 to 1300 K.Cal/NM^3

4. BLOCK DIAGRAM

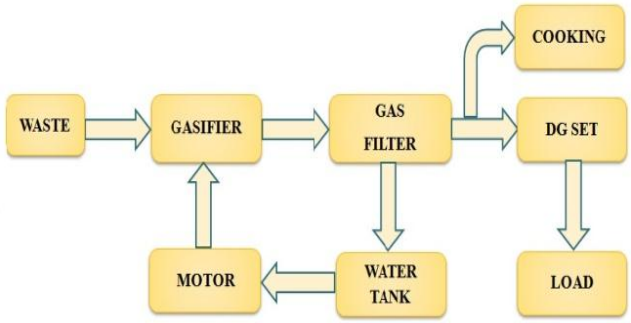

Fig -1: Block Diagram Of Gasifier

As shown in fig. The waste is use as fuel in gasifier. So ,first we add waste in gasifier. Gasifier is doing partial combustion of this waste. So gases are produced from the gasifier. This gas is need of flow for come out. So water circulation is doing by motor. So the combination of the gas and water are goes to the gas filter.

This gas filters have two outlets. One is lower side and second is on upper side. So gas has characteristics of low mass, so gas is go upper side and water comes into the water tank. This water also cooled the produced gas. So water has two purpose. One is to give the flow to the gas and second is to make gas cool. Than water present is given to the motor as input so this is a close cycle of water.

The outer gas is used for two purpose. First for use in cooking and second is for generate electricity by using DG set.

5. ADVANTAGES OF GASIFIER

5.1 Environmental

Gasification has inherent advantages over combustion for emissions control. Emission control is simpler in gasification than in combustion because the produced syngas in gasification is at higher temperature and pressure than the exhaust gases produced in combustion. These higher temperatures and pressures allow for easier removal of sulfur and nitrous oxides (SO_X, and NO_X).

5.2 Carbon Capture Utilization and Storage

Similar to the removal of other contaminants, gasification lends itself to efficient carbon dioxide (CO_2) removal because of the high temperature and pressure of the produced syngas. Studies show that in CO_2 removal applications, integrated gasification combined cycle (IGCC) plants are more efficient than other commercial technologies. Captured CO_2 is prevented from entering the atmosphere through either utilization or storage.

5.3 Feedstock Flexibility

Several gasifier designs have been developed to accommodate various grades of coal in addition to wastes and various types of biomass. Gasifiers can also handle pet coke and other refinery products. The potential for using more than one feedstock in a single facility reduces project risk and may extend the project lifespan.

5.4 Product Flexibility

Gasification can be coupled with advanced turbine technology to produce electricity in an IGCC plant. Syngas produced by gasification can also be further processed into liquid fuels (diesel, gasoline, jet fuel, etc.), hydrogen and synthetic natural gas, or a range of fertilizers or other high-value chemicals including anhydrous ammonia, ammonium sulfate, sulfur, phenol, naphtha and CO_2 as mentioned above, among many others. Also, slag produced from coal ash can be used in the production of building materials such as cement.

5.5 High Efficiency

IGCC power plants offer efficiencies similar to or better than other coal power plants. Additionally, in a carbon dioxide capture and sequestration (CCS) scenario, an IGCC power plant is much more efficient than a pulverized coal combustion power plant. This is mainly due to the decreased energy required to remove CO_2 from the process streams in gasification as compared with a pulverized coal combustion system.

6. DISADVANTAGES OF GASIFIER

Main disadvantage is that downdraft gasifier cannot be operated with range of different feedstocks. Low density feedstock gives rise to flow problems and excessive pressure drop. High ash content coal also gives more problem with this kind of gasifier than updraft gasifier. Other disadvantage is it gives lower efficiency, since there is no provision internal exchange compare to updraft gasifier.The product stream also has low calorific value.

Gasification also faces some disadvantages, mostly related to capital costs and availability. Developments in several research areas could improve the long term outlook and potential market share for this technology.

7. .APPLICATION

7.1 Thermal application

Gasifier produces the burnable gas. So this gas can be used for cooking purpose. So we can use gasifier in Hotel, House, Canteen etc

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7.2 Power application

Gas produce by gasifier can also use in power application by giving this gas as input to DG set and gas generator. So we can use Gasifier in Industry, Company, House and Hotel.

8. CONCLUSION

The efficiency of this plant is better compare to the wind and solar plant. At the end of this project we will produce electricity by waste. Produce gas is also use for cooking purpose.

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