



Biomass gasifier

Biomass is basically an organic material which stores solar energy from sun through the process of photosynthesis. Biomass fuels include agricultural waste, crop residues, fuel wood, woody waste and organic waste like tapioca stalks, soyabean stalks, ground nut shell, coconut shells, sugar cane trash and corn stalks/cobs.

Biomass gasifiers are eco-friendly and renewable source of energy. Biomass does not release CO_2 to the atmosphere unlike fossil fuels as it absorbs the same amount of carbon during growth. It is appropriate, cheap, eco-friendly and renewable source of energy.

Biomass gasifier converts solid biomass into more convenient gaseous form. Normally, the ratio of air to fuel required for complete combustion of the biomass is 6:1 to 6.5:1 which is defined as stoichiometric combustion with end products being CO_2 and H_2O . In the gasifier the air-fuel ratio is 1.5:1 to 1.8:1 under sub stoichiometric conditions. The gas produced is producer gas which is combustible having calorific value of 4.5-5.0 MJ/Kg.



The gasifier system

The gasifier system comprises of a reactor for generation of combustible producer gas which after cleaning and cooling process is made available for power generation/thermal applications. The producer gas from gasifier can be used to run diesel engine. Gasifier when connected with electric generator through thermal engine can generate electricity. One cu.m. of gas can generate thermal energy of the order of 4.5-5.0 Mj with flame temperature of upto 1200°C .

The gasification process

The gasification process converts carbonaceous material such as coal, petrol and bio-fuel, biomass into carbon mono-oxide (CO) and hydrogen (H). Gasification is more effective than direct combustion of the original fuel because it can be combusted at higher temperature so that the thermo-dynamic upper limit to the efficiency defined by 'carnot cycle' is higher. Higher temperature combustion refines out corrosive elements such as chloride and potassium. During pyrolysis process carbonaceous matter heats

up and volatile matter are released and char is produced resulting in 70% weight loss. When gasification process occurs char reacts with steam producing CO and H₂.



The gasifier process

The gasifier process dates back to 18th century for lighting and cooking.

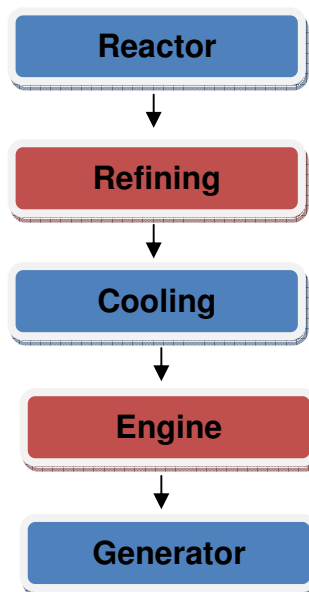
In the 19th century gasification was used for production of synthetic chemicals sustainable plants of capacity 250-1000 KWhr and have been set up for rural electrification in remote villages which were not connected by State Electricity Company. There are no transmission line losses and desired voltage is obtained due to localised supply.

About 1.2 Kg of wood/biomass is required for generation of 1.0 kwhr of energy. About 20-30 kwh plants which are sufficient for needs of villages cost around Rs. 2.00-3.00 lakhs, including cost of electricity generation. One plant has been set-up at Kukru Khamb near Betul (M.P.) where a 'Atta chakki' is being run through gasifier. In case of higher capacity plants like 2.5-6.00 mega watt there is provision of supply to State Electricity Grid after signing MoU with State Electricity Board.

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Process Flow Chart



Finance and subsidy etc. is provided by Ministry of Non-conventional and Renewable Energy Sources, Government of India, New Delhi.

Entrepreneurs can contact State Energy Corporation of their State for assistance.



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Note: The author may have used various references in the preparation of this article. For further details please contact him/her.

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