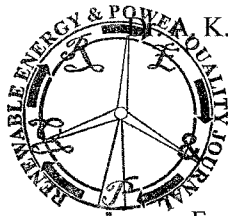


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Economic Viability of Bamboo Dust Based Gasification Plant for a Paper Mill



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Abstract. Global concern over pollution and several related issues caused by increase in Green House Gas emission and consequently changes in climate have resulted in a paradigm shift in the approach towards development of the energy sector in many countries. Being relatively less expensive than other renewable sources like solar and wind energy and being geographically dispersed, biomass is a potential alternative for fossil fuels like coal to sustainably meet the increasing energy needs of the world. In addition to this, biomass is carbon dioxide neutral and is a reliable source of energy.

In this paper a pilot project is conceptualized on the use of bamboo dust waste for Cachar Paper Mill located in the state of Assam, India. This paper mill is a source of biomass in itself as it generates about 35-40 tons of bamboo dust every day. This project is conceived to economically generate electricity by utilizing producer gas derived from a gasifier by means of a gas engine coupled with an alternator, thus contributing its share towards renewable energy in the country. An economic viability study has been carried out by calculating the cost of generation of electricity for the plant to produce this green energy as against that of convention coal fired steam generation. This paper further highlights how burning of reasonable quantity of coal can be avoided by replacing some quantum of electricity generation through renewable energy sources resulting in appreciable amount of cost savings.

Key Words

Biomass gasification, producer gas engine, renewable energy, paper mill.

1. Introduction

Nature's endowments in the form of natural resources are used by human beings for their sustenance. Conventional sources of energy based on oil, coal and natural gas are used extensively for generation of electricity worldwide. However over exploitation due to ever increasing energy demands of these resources, will lead to scarcity and ultimately result in exhaustion. The dwindling coal reserve of the planet is a living proof in support of this fact. To ensure stable long term supply of electrical energy in the future, the use of alternative non

conventional or renewable sources of energy is only solution. Being CO₂- neutral, they also help in reducing the effect of the green house gases.

Renewable sources of energy like solar and wind energy are characterized by high investment cost and seasonal and site dependency. The total energy stored in terrestrial biomass outnumbers the annual world energy consumption by a factor of more than fifty. Biomass is easily available and a relatively cheaper technology to install for generation of decentralized electricity. Worldwide, biomass-to-electricity generation has gained importance due to employment opportunity, reduction in reliance on fossil fuels and positive environmental benefits.

Biomass is a source of energy in the form of crops, seaweed, animal waste, wood or any other organic matter [1]. It is one of the oldest forms of energy used by man and is renewable. It derives its source of energy from the Sun and converts the radiant solar energy into chemical form of carbohydrates or sugars through a process of photosynthesis.

A. Rationale:-

There are a number of reasons [2] why biomass is an attractive feedstock for electricity generation.

- 1) Environmentally biomass has several advantages over fossil fuels like coal and petroleum. It contains lesser amounts of nitrogen and sulphur as compared to fossil fuels thus not contributing towards the formation of acid rain. As plants grow, they utilise CO₂ present in the atmosphere, keeping the levels of carbon dioxide balanced.
- 2) Since any biomass material can undergo gasification, this process is much more attractive than ethanol production or biogas where only selected biomass materials can produce the fuel.
- 3) Economic factors also support gasification as it uses bamboo dust waste produced in the mill and