

Introduction

We are extremely thankful to you for the interest shown in our biomass gasifier based power project. This technology of 'Future', finds wide acceptance from small, medium and large industrial sectors by its uniqueness of lowest cost of production, simplicity in operation, absolutely free from air and water pollution.

Rural Electrification:

This is very much viable and suitable for the rural electrification projects. In India Biomass Gasifier plays major role in Remote / Rural Village Electrification Projects.

- **Rural areas produce enough biomass & agricultural residues so that all its electricity demands can be met by using biomass gasifier based power plants.**
- **Apart from providing the rural energy self-sufficiency it can also generate enough employment opportunity to the rural people.**
- **Distributed Generation through locally and abundantly available fuel which can be cultivated to the demand, so completely it is grid independence and self-reliance.**
- **Rural Employment & Waste land development is possible through this sustainable and renewable source of energy**

Industrial Application:

Nowadays the industrial sectors are facing stiff competition from international market and they are unable to compete with the other developing nations due to soaring production cost. The foremost reason for the increasing production cost is due to the high Electricity Tariff in our country. The major portions of the electricity generated are from rapid depleting fossil fuels like Coal, Lignite, Diesel and Natural gas. Usage of these fossil fuels threatens the life of Human being through various environmental impacts like air pollution, global warming and etc.

In this world of cost consciousness and competition one should be able to incorporate any thing that could keep the industry viable. To overcome these problems, we are being forced to switchover to cost effective, Renewable & Eco-friendly source of energy. One such energy is Biomass, which is available in abundant and also can be cultivated to our energy

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requirements.

The latest developments in biomass gasifier have proved to be highly yielding as a major source of energy. We strongly feel and appeal that with the soaring cost of power production bringing down the level of profitability, the only way out is the large-scale application of biomass gasifier for power generation and Thermal applications.

Aruna Electrical Works (P) Ltd., are the leaders in Biomass Gasifier Systems. We are designers, manufacturers and suppliers of biomass Gasifier Power. Our Gasifier projects are approved by Ministry of Non – Conventional Energy Sources, New Delhi for generation of electrical power as well as thermal applications. We have sufficient technically qualified manpower as an implementing organization.

Economical Benefits:

Power Generation: The Power Plant can generate power @ around Rs. 2.0 per unit (kWhr) excluding investment interest and

Thermal Application: The Gas produced from around 4 kilogram of Biomass can approximately replace one liter of Furnace oil / Diesel. One liter of furnace oil will cost Rs. 21/- and four kilogram of Biomass will cost Rs. 5/-, i.e. Twenty One Rupees fuel can be replaced by Five Rupees fuel. **Every litre of furnace oil saved will save us Rs. 16/-.** Similarly one liter of Diesel @ Rs. 34/- can be replace by 4 kgs of wood @ Rs.5/-, which will result in **cost saving of Rs. 29/- for every liter of Diesel saving.**

Also the plant will generate around 3-4% charcoal as byproduct, which can be sold in the market as it is or it can be sold as Activated Charcoal after value addition, which generates additional revenue. Apart from this we can avail the CDM benefits of around Rs. 0.15 per unit through carbon trading.

Social Benefits:

- This improves rural economy and employment through Biomass supply.
- The plant will also encourage the concept of energy plantation thus resulting in greener environment resulting in more rainfall and reduction in ambient temperature.
- Sustainability by producing industrial grade electricity from renewable sources.

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- The costs of installation per kWe are about the same as for large power levels (of the order of hundreds of MWs) and the plant load factor is about the same as for large thermal power plants.
- Also, when the power generation package is suitably selected, the cost of energy is perhaps the lowest amongst all the power generation strategies.
- Hence it provides a sustainable, affordable and eco-friendly alternative to fossil fuel based power plants at low power levels.
- It improves the country's energy self-reliance and reduces the crippling oil import bill and saves enormous foreign exchange.
- The project is carbon-di-oxide neutral and generates very little sulfur dioxide and nitrogen oxides compared to fossil fuel based power plants.
- The process produces very low emissions of un-burnt primary fuel and no fly ash, since the solid fuel is subjected to multistage thermo-chemical conversion process.
- Energy conservation by consuming lesser energy resources for achieving the same output of electricity owing to higher cycle efficiencies.
- The country's energy security is improved by meeting the nation's current electricity needs with short gestation projects using locally produced fuels.

To enhance the understanding further about Gasifiers, you can find the following information which is more helpful and informative.

What is Biomass?

Biomass is organic material, which has stored solar energy from sunlight in the form of chemical in the plants through the process called photosynthesis. Biomass fuels include Agricultural Wastes, Crop Residues, Wood, Woody Wastes & Organic Wastes etc. Unlike fossil fuels Biomass does not add carbon dioxide to the atmosphere as it absorbs the same amount of carbon while growing. It is the cheapest, eco-friendly, renewable source of energy.

What is Biomass Gasification?

Biomass Gasification converts solid biomass into more convenient gaseous form. The ratio of air-to-fuel required for the complete combustion of the biomass is 6:1 to 6.5:1, which defined as stoichiometric combustion with the end products being CO₂ and H₂O. In gasification the combustion is carried at sub-stoichiometric conditions with air-to-fuel ratio being 1.5:1 to 1.8:1. The gas so obtained is called producer gas, which is combustible having a calorific value of 4.5-5.0 MJ/kg, with an average composition of CO : 20 ± 1%; CH₄ : 3 ± 1%, H₂ : 20 ± 1%, CO₂ : 12 ± 1% and rest, N₂. This process is made possible in a device called gasifier. A gasifier system mainly comprises of a reactor, where the combustible gas is generated and the gas is made available for power generation / thermal application after the required cleaning and cooling process.

Power Generation Application:

Using producer gas, it is possible to operate a diesel engine on **Dual Fuel Mode** with marginal changes to the air inlet or in a **100% Producer Gas Engine**. In dual fuel mode, diesel substitution of the order of 80 to 85% can be obtained at nominal loads. The recent developments have made possible the operations of Spark ignited gas engine using producer gas alone. The mechanical energy thus derived can be used directly to energizing mechanical device or by coupling with an alternator for electrical power generation, either for local consumption or for grid synchronization.

Thermal Application:

Like any other gaseous fuel, producer gas has the advantage of better and finer power control, more efficient and environment friendly when compared to that of solid fuels. Burning of 1 m³ of Producer gas in the burner will release thermal energy of the order of 4.5 to 5.0 MJ. Flame temperatures as high as 1200 °C can be obtained by optimal pre-mixing of air with producer gas. For processes, which require thermal energy, gasifiers can be a good option as a gas generator, and retrofitted with existing devices. Few of the applications where retrofit is possible are:

Dryers: Drying is the most essential process in industry like tea, rubber, cardamom etc. It requires hot gases in the range of 120 - 130 °C. Gasifier could be an ideal solution for the above situation, where hot gas after combustion can be diluted with the required quantity of secondary air, so as to lower its temperature to the desired level for operation.

Kilns: Baking of tiles, potteries require temperature range of 800 - 950 °C. In conventional practices they burn large quantities of wood in an inefficient manner. Gasifier could be suitable for such applications, which provides a better control of temperature with smokeless operation thereby enhancing

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the product quality.

Furnaces: In non-ferrous metallurgical and foundry industries high temperatures (~650 - 1000 °C) are required for melting metals and alloys. Expensive fuel oils or electrical heaters generally meet this. Gasifiers are well suited for such applications.

Boilers: Gasifiers are well suited for any process industries, which require steam / hot water.

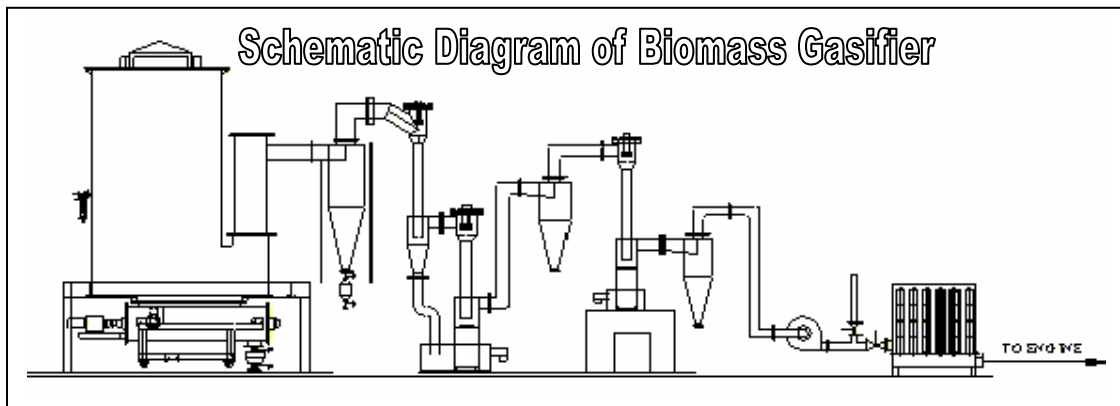
Apart from these, energy requirements in mass cooking, poultry farms, cold storage devices (vapor compression refrigerator), rubber industry and so on could be met using biomass gasifiers.

Economical Benefits:

Sl.No.	Application	Description	Benefit
1.	100% Producer gas based power generation	Approximately 1 Kg of wood will produce 1 unit of electricity, which costs Rs. 1/- and the operation & maintenance will cost around Rs. 0.5/-. Totally it cost around Rs. 1.5/- per Kwhr(unit)	It is much cheaper than EB's tariff of around Rs. 4.75/- per unit and cost of production in DG set of around Rs. 8/- per unit
2.	Duel Fuel mode power generation	One unit of electricity is produced using 0.9 Kg of wood + 50 ml of diesel. Totally it cost around Rs.2.5/- per Kwhr(unit)	It is much cheaper than EB's tariff of around Rs. 4.75/- per unit and cost of production in DG set of around Rs. 8/- per unit
3.	Thermal application	Approximately 3.5 Kgs of biomass can replace 1 litter of HFO/Diesel in thermal energy. Approximately Biomass @ Rs. 5/- can replace HFO @ Rs. 21/- & Diesel @ 33/-	Cost saving of around Rs. 16/- & Rs. 28/- respectively in replacement of HFO & Diesel excluding O&M cost.

Other Benefits:

- Conservation of depleting fossil fuel
- Conservation of Environment from Global warming & Pollution
- Encourage energy plantation thus resulting in a green environment
- Improvement of nations energy security using locally available fuels
- Provides a sustainable, affordable and eco-friendly alternative to fossil fuel



List of Projects

Sl.No.	Project Address	Capacity	Installation Date	Application
1.	Nagoan Paper Mills, HPCL, Assam	4 MW	Under Implementation	Thermal
2.	Cachar Paper Mills, HPCL, Assam	4 MW	Under Implementation	Thermal
3.	APE (P) Ltd., Villupuram, Tamilnadu	1 MWe	Under Implementation	Grid connected Power Project
4.	Aruna Electrical Works, Villupuram	100 kWe	2004	Captive Power Generation
5.	MP Forest Department, Kasai Village, MP	2x10 kWe	2005	India's First Remote Village Electrification
6.	MP Forest Department, Debrabandi Village, MP	2x10 kWe	2005	Remote Village Electrification
7.	DFO, Jawalagiri Village, Hosur, Tamilnadu	12 kWe	2005	Power Generation for Irrigation
8.	DRDA, Periyampatti, Dharmapuri, Tamilnadu	12 kWe	2005	Power Generation for Village
9.	DRDA, Alwarthirunagri, Tuticorine, Tamilnadu	12 kWe	2006	Power Generation for Village
10.	DRDA, Paalur, Nagarkoil, Tamilnadu	12 kWe	2006	Power Generation for Village
11.	Madhya Pradesh Forest Department, Bhopal	18x10 kWe	Under Implementation	Remote Village Electrification
12.	Biomass Energy for Rural India, Bangalore	12 kWe	Under Implementation	Remote Village Electrification
13.	DRDA, Killukottai, Pudukottai, Tamilnadu	12 kWe	Under Implementation	Power Generation for Village
14.	DRDA, Kudalore, Pudukottai, Tamilnadu	10 kWe	Under Implementation	Power Generation for Village
15.	DRDA, Muthayapuram, Tuticorine, Tamilnadu	12 kWe	Under Implementation	Power Generation for Village
16.	Irrungattukottai Panchayat, Tamilnadu	12 kWe	Under Implementation	Power Generation for Village
17.	DRDA, Therkumedu, Thirunelveli, Tamilnadu	12 kWe	Under Implementation	Power Generation for Village
18.	DRDA, Kadaiyam, Thirunelveli, Tamilnadu	12 kWe	Under Implementation	Power Generation for Village
19.	DRDA, Nattalam, Nagarkoil, Tamilnadu	12 kWe	Under Implementation	Power Generation for Village
20.	DRDA, Vazhudavoor, Villupuram, Tamilnadu	12 kWe	Under Implementation	Power Generation for Village
21.	DRDA, Arrur, Villupuram, Tamilnadu	12 kWe	Under Implementation	Power Generation for Village
22.	DRDA, Verapandiapatnam, Tuticorine, Tamilnadu	12 kWe	Under Implementation	Power Generation for Village

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