Use of Biomass in meeting the Energy demand of Remote Rural Villagers In a Socially and environmentally sound manner.

By
S.K.Bose, Senior Advisor
GP Green Energy Systems Pvt. Ltd.

Introduction

India has a large potential for renewable energy (RE), an estimated aggregate of over 100,000MW. In addition, the scope for generating power and thermal applications using solar energy is huge. However, only a fraction of the aggregate potential in renewable, and particularly solar energy, has been utilized so far.

Biomass as a source of Renewable Energy is most important in view of its sustainability as well as economic viability in respect of its use both for rural electrification and Industrial application.

Biomass Power: Gasification and Biomethanation.

The advantage of Biomass is that it can be used to generate electricity with the same equipment power plants, with some modification, that are now burning fossil fuels. It is an important source of energy and the most important fuel worldwide after coal, oil and natural gas. Biomass energy is an alternative energy source as it is renewable and free **from net CO2 (carbon dioxide) emissions,** and is abundantly available on earth in the form of agricultural/forestry residue, city garbage, cattle dung, firewood, etc.

Biogas which can be derived **from Wet Biomass,** such as, Cattle dung, vegetable/food waste, fruit waste, organic part of MSW, soft grass, water hyacinth, other selective plants etc. is expected to become one of the key energy resources for global sustainable development.

Biomass Gasification Technology

Biomass gasification process can be used for both thermal and electrical applications. Generally dry biomass, such as, firewood, agricultural residues such as rice husk, cashew shell, coconut shell, mastered /maize stalk etc., are being used in gasifiers for generation of producer gas. In India, there is wide range of gasifiers available with capacities varying from 10 kW to 500 kW for electrical & thermal applications. Thermal gasifiers finds applications in industries like bakeries, steel re-rolling, engineering industries, tiles manufacturing, brick kilns, chemical Industries etc.,

However, for rural electrification usually 10 to 20kWe capacity biomass gasifier based power plant on 100 Producer gas engine modes, is being used. Cost of installation of such power plants is in the rage of Rs.8.00Lakhs to Rs.11.00Lakhs and there is further additional cost involved for power distribution to the houses of the families as well as running such plant by the suppliers for certain period in case of Demonstration Plant.

Biogas Technology (Biomethanation)

At present, biogas technology provides an alternative source of energy in rural India for cooking mostly by Biogas Plant, popularly known as Gobargas Plant, which run by Cattle dung only. It is particularly useful for village households that have their own cattle. Through a simple process, cattle dung is used to produce methane based gas, which serves as fuel for cooking and the residue is used as manure. The gas essentially comprises of Methane (CH4) and Carbon di-oxide (O2) in the ratio 60:40. It is the methane, which has the fuel value.

Use of Biomethanation Technology for Rural Electrification

Whenever question comes for rural electrification, major focus is being reflected to **Biomass Gasifier based Power Plant (BGPP)** on 100% producer gas engine mode, as in this case cost is much lesser to solar power. But due to various constraints, such as, lack of availability of dependable 100% producer gas engine, increasing of cost of "Dry Biomass", lack of training for operating BGPP, short duration operation (4hrs.in evening) etc. progress could not be made as per plan.

Considering the huge potential and due to operational advantages, equal importance need be given for installing **Biogas Plants** (Biomethanation Process) to generate biogas for power generation either exclusively or parallel with BGPP; for rural electrification. In certain areas, there may be abundance of Wet Biomass, which is suitable and more economical to use for generating Biogas.

M/s. GP Green Energy Systems Pvt. Ltd.

M/s. GP Green Energy Systems Pvt. Ltd. (GP Green) a private limited company, having its office at BH 114, Salt Lake, Kolkata-700091 is a subsidiary Company of **M/s. Grain Processing Industries (India) Pvt. Ltd. (GPI)**, having its registered office at 29, Strand Road, Calcutta – 700 001, India.

With the aim to pay proper attention to manufacturing, marketing & after sales services to all the aforesaid products of GPI, the management of the Company hived off the Gasifier Business to newly registered Company viz GP Green Energy Systems Pvt. Ltd. (GP Green). To begin with, the newly established company has been given the sole responsibility of Marketing the Gasifier and rendering after sale services, which help the Group to increase the market share of gasification technology substantially during current financial year. Now GP Green has also started manufacturing the same biomass Gaifier simultaneously with Coal gas Gasifier, which has a good demand for heat energy. It supplies 10 to 40 kW capacity gasifier fitted with100% producer gas engine for rural electrification.

M/s. GP Green Energy Systems Pvt. Ltd is undertaking turnkey job of installing Biomethenation and supplying 100% Biogas Engine for power penetration.

Rural Electrification vs. Rural Energy Security

Giving Importance to generate and use of Biogas

To generate Electrical Power for Rural Electrification their is need for gas based generator in respect of both the above referred gas. As requirement is small capacity generator/engine for remote rural electrification and no such dependable engines are readily available in the

market, it requires modification of existing fossil fuel based engines, many of those proved to be less efficient. Arranging and installation of such engines with Gasifier or Biogas plant may not pose much problem. But availability after sale service/ repair of such engines is the real the problem. Considering this problem and also considering the fact that in most of the remote rural villages there is hardly any Industrial activity, which may demand electrical power and the villagers in such areas need energy for cooking food and lighting for 4 to 5 hours in the evening. This basic need of fuel for lighting and cooking are presently being met partially by costly Kerosene oil, inefficient burning of Wood and Cattle Dung cake, causing health hazard and emission of Co_2 and continual aforestation.

Direct use of gas for Cooking and Lighting

In villages, the primary domestic uses of energy are for cooking and lighting. Best solution to the problem is direct use of either producer gas or biogas or both, as the case may be, for direct burning of gas through burner for cooking and illumination through gas lamp for lighting. Reported gas consumption for cooking and lighting is 0.34 to 0.37 m^3 per capita/day and 0.15 m^3 per hour per 100-candle power respectively. **Thus, a family of 5 members will require 2.60 to 3M3 biogas per day for the following use: -**

i).Cooking purpose @ average0.37.5M3/ head, for 5 Heads= (0.37x5)	=	1.85M3
ii). Lighting purpose@0.15M3/gas light, for 5 lights for 5-6 hrs.(.15M3x5)	=	0.75
Total	**=**	**2.60M3**

Thus, a typical family of five to six members uses approximately 2.60 to 3.00M3 biogas per day to cover their basic requirement of Energy. To generate 3M3 biogas only 24 kg of vegetable/organic waste or 75kg of cow dung will be required per day. This much facility to a large numbers of family will not only improve the standard of living of these families but also will save large quantity of wood/coal/cow dung (used for dung cake) and less emission of CO2, which are direct benefit. The indirect benefits are immense, such as, people will learn to derive benefit out of waste, children of the targeted families will get the scope to study in the evening, the organic compost to be produced through biogas plant will help improving soil fertility etc.

Direct thermal application

In certain areas if it is found their is some small/cottage Industrial activities which demand electricity and there is availability of both Dry and Wet biomass; in such area generation of both producer gas and biogas should be considered and any one of the same can be used for electricity and the other one can be allowed to use directly for aforesaid purposes. It can be observed in remote Rural place there may be one or two small Bakery units for making low cost bread and biscuits, where heat energy is obtained mostly by burning fire Wood, which can be replaced by direct firing of gas. Similarly in some area there may be one or two wheat grinder/ Husking mills, which are being operated by diesel engine, which can easily be converted to gas operating system, by either of the gas. **Adoption of such a system will not only have a reduction of capital cost but also will be an effective step towards Energy Security in a sustainable manner for the target group**

Conclusion

As per above suggestion of direct use of gas both for the cooking and direct illumination for lighting, the work of providing Energy security to the Rural Community will be easier and faster, **in view of the fact that India's energy requirements are enormous and the demand is growing but our resources are limited both in physical and financial terms,**

The direct use of both producer gas and biogas will be **much reliable & safe as compared to conversion of gas to electricity** in remote rural areas, were getting a mechanic for repairing of generating sets is not only difficult but also time taking. Moreover, actual need in remote areas is the energy for cooking and lighting and many of them can not afford electricity other than lighting. As regards to **availability of efficient and eco friendly better technology** one must agree that operating a Biogas plant is easier than operating a Biomass Gasifier Plant. Besides the use of affluent of biogas improves fertility of agricultural field, while the effluent of gasifier plant is a pollutant. Availability of Biogas Digester (even for batch feeding) is not difficult and if a digester is properly installed it can serve the purpose for 20 years with proper maintenance, while a small gasifier plant may have average life not more than 10 years.

However, the purpose of expressing the merits of Biogas is not for substituting the gasifier but for highlighting the purpose of **providing equal importance in respect of use of Biogas with producer gas (Gasifier) for faster & effective implementation of providing Energy Security to Remote Rural areas.**

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