

Economic Viability of Biogas Generator in Comparison with Diesel Generator and Local Electricity Connection

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Abstract :-

When animal manure or other organic matter decomposes in the absence of oxygen, it produces a gas containing 60 to 70 percent methane. If released into the atmosphere, methane is a powerful greenhouse gas, with 21 times the heat-trapping effect of carbon dioxide on global warming. But burning methane curbs its harmful effect on the climate and releases large amounts of useful energy. Methane is a relatively clean fuel that is the main component of natural gas and LP gas used to heat homes and to fuel electricity generation. By capturing methane, 425 landfills across the country turn decomposing garbage into a valuable energy source.³⁹ For decades, some large dairy and swine operations have been managing their immense amounts of manure by processing it using “anaerobic digesters” to produce and store biogas, which is then used to power generators and for thermal energy. Several digester technologies are in use, the most common of which is a covered manure lagoon, from which biogas is piped to a generator. Most of Area has warm enough weather for anaerobic lagoons, but there are also heated “plug flow” and “complete mix” systems, which are primarily used for dairy operations. Some systems are capable of “co-digestion,” which allows other types of organic wastes to be processed along with manure. Whatever technology is employed, a biodigester system is a waste management solution has many benefits.

Keywords:

I. INTRODUCTION

Biogas is a gas which is allocated at decomposition of organic substances. It, unlike natural gas, it is possible to receive in industrial conditions by fermentation an organic waste and specially grown up power plants. Biogas structure: 50-70% of methane (CH₄) and 50-30 % of carbonic gas (CO₂). Being close to natural gas under characteristics, biogas can be used in the same purposes (manufacture of the electric power, heat, automobile fuel etc.), and at due degree of clearing becomes identical to it on structure. Thus, biogas is renewed analogue of natural gas. Manufacture of biogas not only does not consume the electric power, it gives raw materials for its development and relieves the enterprise of necessity to lay a gas pipeline and to install electrical equipment from public networks. Also processing of an organic waste in biogas and bio fertilizers is, perhaps, the most harmless way of recycling of this sort of a waste.

- Almost free gas: biogas. The technology of clearing allows to prepare the gas received from an organic waste for the various purposes – receptions of the electric power, refuelling of cars and so on. Thus that gas rises in price, development own – rescue, especially for the remote areas is simple, a gas pipeline to which costs considerable money.
- Economy of capital expenses about 40 % from cost of biogas station. If your enterprise at present is in process of building, biogas installation (biogas station) will allow to save on a lining of a gas pipeline and transmission lines, and as on installation of lagoons and reserve a generator diesel engine.
- Independent power supply: your enterprise itself will provide itself with the electric power and heat. More than any dependence on a rise in prices, switching-off and electric power differences in a public network!
- Heat: in the course of work of biogas station there is a generator cooling, biogas is burnt. The technology used in our biogas stations, allows to use it warmly for enterprise heating, and as for actuating of refrigerators.
- As a result of bioreactor work it turns out not only biogas, but also qualitative bio fertilizers. As it is known, such waste as manure or the bard, become effective fertilizer only in 3-5 years. At use of biogas station a rewantering waste becomes the effective fertilizer raising productivity on 30-50 %, practically at once, and their cost price is almost equal to zero.

Having established at the enterprise biogas station with our help, you receive quickly sold system which will present to your enterprise independence and notable profit.

II. Raw materials for biogas reception

Biogas reception at stations which are built by our corporation, is done possible by processing of an organic waste from integrated poultry farms, the farms specialising on cattle and other enterprises during which work the considerable quantity of an organic waste is thrown out. Last years interest of business, a science and the public to harmless ways of recycling of a waste has increased, no less than interest to the alternative energy sources, caused by a rise in prices for the traditional. We will stop hardly more in detail on raw materials of which it is possible to make gas, suitable for use in the household and industrial purposes. Our corporation offers the equipment for realisation of this possibility. It is considered to be that biogas is made of manure though in practice of kinds of raw materials, for development, it is much more suitable biogas. It can be manure (both dense, and liquid), food-processing industry production wastes, the food and fodder rests, the bard, a residue, biodust from public utilities and an other organic waste. Besides a waste for biogas manufacture power plants which can be grown up specially for these purposes can be used. It is corn, grain, sunflower, various grasses, and as a beet, a silo and so on. Some figures: one ton of manure of a horned cattle gives 30-50 m³ biogas, 60% which are made by methane, the ton of various kinds of plants on an exit will give 150-500 m³ biogas from 70% the methane maintenance, and the ton of fat after processing is 1300 m³ biogas, 87% which are made by methane. Better to say, for days we can receive from one cow — 2,5 m³ biogas, from a bull on fattening 1,6 m³, pigs — 0,3 m³ and from a bird — 0,02 m³ biogas. It is important to notice that installation on biogas manufacture is arranged in such a manner that for its limits will not get neither a characteristic stench for a processed waste, nor toxic substances which in other conditions pollute atmosphere and lead to illnesses. Reception of biogas from an organic waste is not only own gas source. Processing of an organic waste in gas and fertilizers by means of our biogas installations is first of all a harmless way to get rid of dangerous dust and to take from it not harm, and advantage.

III. Economic aspects

Transition of the enterprise to own biogas is connected with essential economic gains. Here some economic aspects connected with processing of an organic waste at biogas stations:

- The general annual volume of an organic waste is an order of 624,5 million tons.
- From this waste it is potentially possible to receive 31 225 million m³ biogas.
- This volume of biogas can give 68 695 Gvt to energy and 85 869 Gvt heat.
- Biogas installations very quickly pay off and start to make for the enterprise profit.
- Since the system capacity is too small and there is a risk of unstable production of biogas, the produced electricity cannot be sold to the national grid but can be used within the farms or community.
- This assessment was aimed to investigate the feasibilities of electricity production from biogas and supply within the farm to save the electricity bills under different scenarios.

Electricity Generation

An electric generator was connected with an engine (Honda modelled GX 160) modified for use with biogas fuelling. At the operated speed of 3000 rpm, the engine was designed to generate electricity at 220 V, 50 Hz and 2.2 kW with gasoline fuelling.

A series of tests were carried out to optimise the engine performance and electricity generation of the modified engine. The results are presented in Fig. 4. The maximum electrical electricity output attainable was 1.6 kW, which consumed about 13.15 l/min of biogas for 1 kW of electricity produced. The overall efficiency was 20.8%.

Table 1. Comparison of 62.5 kva Biogas generator with Diesel Generator:

Per Hour Diesel Consumption in Ltrs.	Per Hour Expenses on Diesel Generators (assumed average diesel price @Rs. 50 per ltr.)	Per Hour Biogas Consumption in Kgs.	Per Hour expenses on Biogas Generators in Rs.	Net Savings Per day (assumed average running 10 hrs. Per day)
10	10x50	12.5	Nil	500x10=5000

Table II. Comparison of 62.5kva Biogas Generator with Local Electricity Connection:

Assumed per Hour electricity consumption	Per Hour Expenses on Electricity (assumed average commercial electricity cost Rs 7 per unit)	Per Hour Biogas Consumption in Kgs.	Per Hour expenses on Biogas Generators in Rs.	Net Savings Per day (assumed average running 24 hrs. Per day)
50 units	50x7=350	12.5	Nil	350x24=8400

Technical Details:

Gas Consumption

25 Kgs of dung is required to generate 1m³ of the gas. The consumption of the gas is 0.8 -1.0 m³ / kWhr.

Power of the engine

Power generated by the converted biogas engine will be approximately 50%-55% in comparison to original diesel engine.

Table III. Live Stock Statistics

Livestock population Statistics of Different Species in Punjab and India (in Lacs)

Species	1990	1997	2003	2007	1990	1997	2003	2007
Cattle	28.3	26.4	20.4	17.60	2045.8	1988.8	1789.4	1990.7
Buffaloes	55.8	61.7	59.9	50.36	842.1	899.2	932.3	1053.4
Horses & Ponnie	0.3	0.3	0.3	0.3	8.2	8.0	8.0	
Donkeys	0.4	0.2	0.1	0.04	9.7	8.8	6.5	4.4
Mules	0.2	0.2	0.05	0.09	1.9	8.8	6.5	4.4
Sheep	5.1	4.4	2.2	2.1	507.8	274.9	615.1	715.6
Goats	5.4	41.1	2.8	2.86	1152.8	1227.2	1244.0	1405.4
Camels	0.4	0.3	0.03	0.02	10.3	9.1	6.3	5.2
Pigs	01.0	0.9	0.3	0.25	127.9	132.9	135.2	111.3
Poultry	152.8	114.6	107.7	188.99	3070.7	3476.1	4289.3	6488.3
Share of livestock within Agriculture GSDP (%)	26.49	32.36	31.92	33.60	22.78	23.17	26.99	23.60

Table IV : Estimated quantities of wastes from 100 cows and 50 calves in a feedlot with shelters and with bedding

	Manure on concrete	Manure +straw	Total quantity per day
Quantity per cow (liters per day)	40.0	6.25	46.25
Quantity per calf (liters per day)	8.0	1.90	9.90
Per cent of dry matter	12.5	16.0	
Quantity of dry matter per cow (Kg)	5.0	1.0	6.0
Quantity of dry matter per calf (Kg)	1.0	0.3	1.3
Total quantity per 100 cows + 50 calves m ³ per day			5.125
Total quantity per 100 cows + 50 calves tone per day			0.665

IV. Conclusion

- Firstly, I would like to say that biogas is not a thing to throw away just like that. because, having it will remove the fear that the world will one day face shortage crisis of natural gas. And Government will spend less for imported gas.
- Secondly, biogas will encourage majority participation in the natural resources trade, that is, there would no longer be a CARTEL comprising of few nations who control the prices of natural gas, in a monopolistic manner.
- Thirdly, biogas would remove this attitude of some nations in the world today, who engage in the practice of using natural gas to sign agreements to assist the other in time of war, and get a certain percentages of this resources as the benefit.
- Fourthly, biogas will enable majority of communities in different countries, to participate actively in the power sector, since these raw materials would be extracted from these communities in various countries of the world. And thereby encourage rapid development from the Rural Areas in various countries of the world.
- Fifth, biogas will encourage large production output, and less production cost, due to the fact that we would no longer need to, for instance, go far to order for the resources needed for production, and no TIME WASTAGE, but limited time, due to the fact that everything would become within reach. Furthermore, INFLATION would be completely reduced to the ground, since we would now have enough resources to set a balance in prices of goods and production cost.
- Sixth, biogas would bring about JOBS creation, and encourages new inventions like chemical experiments, Agricultural development and methods of improving large scale farming. Then, more industries would be created, and a new improved living would be experienced by low income earners in the populace, and this would reduce urban congestion in most countries.

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