

# BIOGAS GENERATOR

## INTRODUCTION

Biogas is a relatively high value fuel which is formed during anaerobic degradation of organic matter. This process has been known for centuries and is being successfully employed in varied applications in many parts of the world.

The interest in biogas use and the technology has grown considerably in recent times which could be mainly attributed to:-

- (1) Rising cost and the uncertainty of future supplies of fossil fuels.
- (2) Growing scarcity of fuelwood, especially in developing countries.

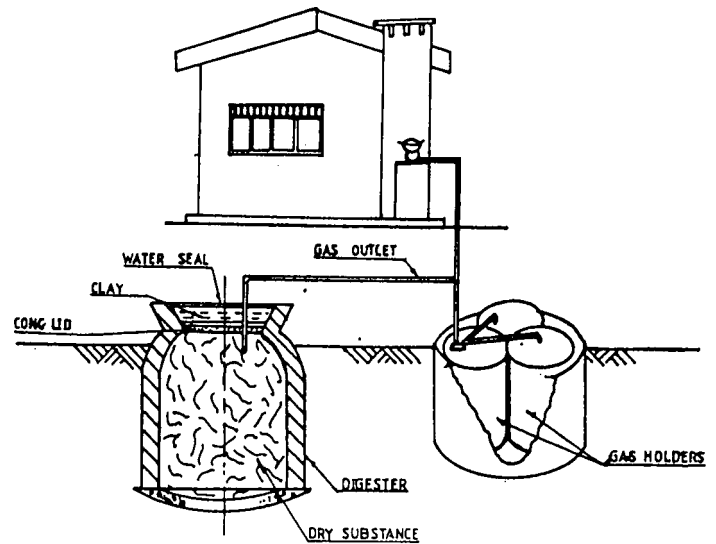
Biogas which provides a convenient source of energy, has many advantages.

- (a) It is a fuel-with high energy content and a good substitute for L. P. gas.
- (b) Feed materials for biogas production are of low commercial value.
- (c) It gives an effluent of high fertilizer value.
- (d) Biogas digesters can be built using locally available resources.
- (e) Environmental and hygienic conditions of otherwise hazardous atmosphere can be improved by this process.

- (i) Non-dependence on animal wastes,
- (ii) No scum-formation,
- (iii) Easy availability of feed material, especially in paddy cultivating areas,
- (iv) One charge produces gas for a period of six months to one year,

- (v) Since very little water is required, the process is advantageous in the dry areas,
- (vi) The digested material used for the production of gas, is a rich fertilizer available in-situ for the farmer, which is capable of providing the entire nutrient requirement of crops.

## DRY TYPE LANKAN BIOGAS GENERATOR



ELEVATION SHOWING GENERAL ARRANGEMENT

Fig. 01

## MAIN USE OF BIOGAS

- (a) For domestic use, lighting, cooking and refrigeration.
- (b) To charge 12V batteries by running a generator using biogas, and the batteries are used for lighting fluorescent tubes with an inverter circuit (known as "Prashakthi") also developed by NERD Centre. There can be one battery charging centre for a cluster of houses. (Refer annexe A.)

- (c) Nitrogen rich organic fertilizer. This can be used in place of chemical fertilizers. There is now a good export demand for organic fertilizer and fruits and vegetables grown using organic fertilizer. Therefore this organic fertilizer can fulfil the fertilizer needs in export oriented farming villages.
- (b) For urban use straw can be easily transported.
- (c) Even after about 6 months of sheltered storage, straw can be used for biogas production.
- (d) Materials for digester construction being easily available locally.

Recent studies have shown that digested manure contains the some fertilizer value as chemical manure. Studies in China have shown that the crop yield has significantly increased by using digester manure. The effluent could immediately spread on to the paddy or vegetable fields.

### CONSTRUCTION OF BIOGAS DIGESTER

Construction of the generator includes a digester, gas holder unit containing three 45 gallons barrels & other connections and accessories. (see Figs. 01 and 02)

The digester is charged with about 1000 kgs. of straw, 50 kg. of cowdung, and few other additives. After about two weeks gas generation starts and continues for a period of over six months.

Daily gas production is about 1 Cu. M. at a pressure slightly higher than that of the atmosphere. For a family of five, this biogas unit is sufficient to give a continuous supply of gas for their daily cooking.

### MAINTENANCE

The new process by the NERD Centre will minimize operation and maintenance efforts and the costs as there is hardly any maintenance once charged. The social resistance that normally exists especially in the urban areas against handling animal and other wastes encountered in the traditional Indian or Chinese type, does not occur in the NERD process.

There is no formation of scum and hence handling and maintenance is easier making it attractive to the housewives.

### POTENTIAL FOR BIOGAS PRODUCTION AND USE IN SRI LANKA

Potential for biogas production in Sri Lanka generally can be considered high due to following factors:-

- (a) Easy availability of straw, the main feeding material, in many parts of the country.

- (e) Majority of Sri Lanka paddy farmers being either subsistence farmers or those who own small plots of land, who would stand to benefit both from biogas for domestic use and fertilizer for cultivation.
- (f) Space requirement for the system being minimal.

However, the extent of adoption of biogas will depend on its economic attractiveness. Basic financial analysis shows that the pay-back period for those who invest on a biogas digester to be relatively small. Nevertheless, incentives have to be made available for the capital investment for the majority of users, as they belong to lower income groups.

### FINANCIAL ANALYSIS

Following assumptions are made in the analysis:

- \* Biogas generator with 1000 kg. feed-capacity will produce gas sufficient for cooking requirements of a family of five, and produce approximately 1000 kg. of fertilizer.

#### (a) For the Rural user

- \* Monthly firewood requirement is 100 kg. This will directly or indirectly (Man hours spent for firewood gathering ) cost Rs. 120/= per month.
- \* Biogas fertilizer has an equivalent value of half that of chemical fertilizer and at current prices (Rs. 8500/= per metric ton of chemical fertilizer) its valued at Rs. 4250/=.

#### (b) For the Urban user

- \* As a substitute for L. P.gas, which cost Rs. 200/= per month. (Fuel and transportation)
- \* Value of biogas fertilizer is only 1/4 of chemical fertilizer, as not sufficient land is available for home gardening and difficulty in arranging the sale of biogas fertilizer.

## EMPLOYMENT AND INVESTMENT OPPORTUNITIES

### In the Construction of Biogas Units

Assuming 1,000,000 households will own biogas units over a period of 10 years, each district will construct 367 units per month. Assuming that two technicians will on average construct 6 units per month, employment generation per district would amount to 115. Thus nationally 2760 persons would have ready income by constructing and servicing these biogas Generators.

### Manufacture of Appliances

Further about 25 individuals in each district will find employment in the manufacture and installation of appliances such as lamps, cookers, conversion of refrigerators to work on biogas etc., making another 600 persons self employed.

It is difficult to organize the construction and installation of appliances by manufacturers themselves. Therefore a services of a 3rd individual is required for taking orders, getting the units manufactured and appliances installed etc.

### Usage of Fertilizer

There is a vast potential of collecting, packaging and the distribution of biogas manure. From each district 660 tons of organic manure is available each month at the beginning and reaching 6600 tons at the end of 10 years.

### Involvement of "Janasaviya" Recipients

Since the capital required for digester construction is relatively small and within the reach of "Janasaviya" recipients they can be made interested in this technology and can be suitably trained for the purpose.

## POPULARISATION OF BIOGAS TECHNOLOGY IN SRI LANKA

The successful dissemination of this nationally important programme will be largely dependent on the coherent organisation of many influencing factors. These would include:-

- \* Public awareness activities,

- \* Financial assistance for manufacture for small scale entrepreneurs,
- \* Extension of Bank credit facilities to purchase straw fed biogas units,
- \* Training of technicians,
- \* Advice and field extension services,
- \* Research and Development activities,
- \* Regulatory assistance from local councils specially in urban areas,

With the available restricted resources NERD Centre has launched a programme focusing attention on many of above factors. A biogas technology training programme where prospective small scale entrepreneurs are trained in the construction, servicing and use of biogas has so far produced more than 30 persons from different parts of the country conversant with this technology. They will construct and service biogas digesters on a commercial basis. Cooking and Lighting appliances are also being made at the Centre for retail sales.

Annexe (A)

### ESTIMATE FOR THE PROPOSED BATTERY SYSTEM WITH BIOGAS CHARGING CENTRE FOR A HOUSIGN SCHEME OF 75 HOUSES

No.	Description	Amount (Rs. cts.)
01	Charging Equipment	15,000.00
02	6 Digesters & 1 Gas Holder	26,000.00
03	Maintenance	1,500.00
04	Feed Material for the Digesters straw / grass	3,000.00
<b>Lighting for 75 Houses</b>		
05	Batteries - 1 per house @ Rs. 700/=	52,000.00
06	3 Lamps	28,125.00
<b>Total</b>		<b>126,125.00</b>

Courtesy

NATIONAL ENGINEERING RESEARCH DEVELOPMENT CENTRE OF SRI LANKA.