BIOGAS

Up-Scaling Biogas for Sustainable Development and Mitigating Climate Change in Sri Lanka

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Preparing a Feasibility Report for the Biogas Report

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2.1. Preparing a Feasibility Report

A feasibility report is the study or analysis of a specific work and it is used to make informed decisions as opposed to hasty misguided choices free from assessment.

The feasibility report also indicates how effective implementation of work or ideas under the specific plan or project will be, keeping in tact its main characteristics in their ability to efficiently analyse the idea. Hence, conducting a feasibility study is an appropriate way of attracting clients to invest in the project. In this chapter we discuss the basic topics that are a vital part to a feasibility report on the construction of a biogas system.

2.2. Survey of site

For site selection it is necessary to inspect the site with the client and discuss the following:

- The main requirement of installing a biogas system;
- The type of feed material to be used;
- Location of feeding material and most convenient way to get it to the inlet;
- Water access for unit and availability in the dry season;
- Purpose of the generated biogas;
- Uses for sludge, which is a by-product of biogas;
- Location where biogas is intended for use.

According to the details provided by clients and space available, a decision can be called on picking a suitable place to locate the unit. This means that arrangements must be made so that the chore of feeding the plant involves as little effort as possible. The running costs and work involved in feeding an installed system must be as low as possible. To decide the unit size and type the following need to be clarified:

- Feeding material available and quantity to be fed per day;
- Purpose and location of intended sludge usage;
- Energy source to be replace by biogas;
- This information will determine appliances and time it can be used.

A Biogas system is a considerable investment and it should not be looked at as a temporary structure. The lifetime of a biogas system is approximately 20-30 years and removing debris and refilling the system is not something that most would be keen on doing. Therefore, it is important to ensure soil type, ground water level and flood level before deciding on the location of the biogas system. If the system is to fed with animal manure it must be located at a lower elevation so it can be fed by gravity or a feeding chamber can be provided. The mixture of the feeding material should be free of sand and stones. Handling of slurry requires high labour input, which can be avoided with proper planning. The outlet of the biogas system should be directed towards the fields or should drain directly into the fields.

The biogas plant should be constructed away from any trees to ensure that the roots do not destroy the system over time. It should also be taken into account that exposure to sunlight will help increase production. The system should not be located where heavy machinery move frequently. Biogas systems should not be located near playgrounds as it should be safe for children and animals. The inlet and outlet tanks should be closed with proper covers made from concrete, metal sheet or wooden plank. Only following the consideration of all these factors should a proposal be made, approved and proceeded by construction of the system.

The biogas system should be functional even when maintenance and attendance is poor. Discuss with the client and request for his approval to work on his system or if it is larger one, to allocate somebody for its maintenance. A background study and discussion on the type of manpower available with the client is important when determining the design of the biogas system.

2.3. Selection of Suitable Biogas Type and Size

After selecting the location for the system and a better idea on the conditions of the site has been understood, it is then important to decide on the type of system that should be built, taking into consideration climatic, economic and substrate specific conditions. Large systems are designed on a case-by-case basis. Typical design criteria are:

- **Retention Time**
  (number of days which the feed stays in the digester)

  The retention time depends on the type of waste and temperature of the site. In Sri Lanka, this is about 30-35 days on an average and if sewerage is used, it is approximately 60 days. If agitation agents are incorporated into the system it is possible to reduce the retention time.

Space

The space available on the site and system size determines selection of a suitable design. Ground water level will dictate if the system is an upright cylindrical system or a horizontal one. An upright one occupies less space while a horizontal one will occupy more. As per the space available, the system type can be selected and space saved.

Existing Structures

Existing structures such as a liquid manure tank, which reduces costs can be used. The construction and design would need to be adjusted to accommodate existing structures.

Minimising Costs

Minimising costs are an important design parameter, especially when the monetary benefits are expected to be low. In this case, the cheapest solution is usually a flexible cover for the system.

Minimising costs is often through as opposed to maximising gas yield and reduced durability.

Before deciding the size of a plant, it is necessary to monitor or collect feeding material for several days to determine average quantity of daily feed. This will help to decide the size of the plant and theoretical gas production.

2.4. Drawing of Layout Plan

Discussions with the client are instrumental when deciding on the location for the installation of the biogas system. After selecting the system type and size it is essential to have the layout with dimensions in order to clear the location for unit installation. The layout plan should also clearly show building area and other barriers. This may be very useful when dealing with top-level management and ease the process for securing client approval.

2.5. Availability of the Material

Check on the availability of construction materials and conduct a price check survey. If these materials are unavailable in the local area do locate as to where they can be found and the relevant transport charges to site.

2.6. Work Estimation

After observing and gathering information on the site a master plan can be made in collaboration with personnel at the site who has the ability to take decisions on such matters. Other important matters to be considered before making the

quotation are:

- Access to transport and suitable place for storage of material.
- Location for transport of excavated soil, as it must be cleared before the start of construction.
- Availability of water during the construction period.
- Accommodation and food for masons during the construction period.
- An agreement on building materials and labour for excavation that are to be provided by the client must be arrived at prior to the start of construction.

The feasibility report should include findings and assessments and give reasons for mutual decisions made on site. Such records may be helpful in the event of client complaints regarding wrong assessments or delays in construction performance.

2.7. Biogas Production, Replacement Options and Cost Recovery

Type of feeding material used and quantity required are instrumental in calculating the rate of biogas production. Based on theoretical production rates it is possible give options about the appliances, which can be fuelled by biogas. By replacing the energy source it is possible to calculate savings through the use of biogas.

If other prices remain constant and the cost of replacing the energy source is considered, the recovery cost of the unit can be calculated.

2.8. Time Plan and Deliverables

Deliverables refer to mobilisation, excavation, starting construction etc. and project deadlines. This provides clarity on each stage, deliverables at each stage and when the project is likely to be completed.

2.9. Warranty Period and Payment terms

The feasibility report should clearly mention details of the warranty; the contents under the warranty period and all terms and conditions.