Client: Mr.Akshay

TECHNO-COMMERCIAL

PROPOSAL FOR BIOWASTE TO BIO ENERGY PROJECT FOR

CAPACITY: 5 kg of food waste or kitchen waste

Design, Engineering, Manufacture and Supply By

Synod bioscience

environmental solutions for tomorrow, today...

Kammanahalli main road, Bangalore -84

Contact person:Mr.Ashwini

Ph:9686623587

स्वच्छ भारत

एक कदम स्वच्छता की ओर

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1. PROJECT BACKGROUND

Solid waste management is a process of treating biological waste and to produce solid waste suitable for discharge to the environment or for reuse with some bi-products. The process of biological treatment can be done either by aerobic fermentation or by anaerobic fermentation. Due to high running cost for aerobic treatment an aerobic treatment is usually promoted which can produce Biogas and manure which can be used as fertilizer.

Biogas is produced by anaerobic digestion or fermentation of biodegradable materials such as biomass, manures, sewage, municipal waste, green waste, and plant material and energy crops. This type of biogas comprises primarily methane and carbon dioxide. Anaerobic digesters also function as a waste disposal system. Even for human waste, and can, therefore, prevent potential sources of environmental contamination and the spread of pathogens. Industries and institutions are also made possible, from the sale of surplus gas to the provision of power for industry; therefore, biogas may also provide the user within come generating opportunities.

The true degree of effectiveness of biogas plants and consequently their profitability is in the maximum possible utilization of annual hours of full capacity use. Procurement of highest-quality components reduces downtime to a minimum. Profitable biogas plants provide additional yield from constant full capacity running with cost savings achieved from a low degree of downtime. In this way, it is possible to achieve a working life of 20 years or more with a biogas plant.

The proposal for 20-30kg bio waste treatment plant has been designed based on the bio waste characteristics provided by the client.

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2. DESIGN BASIS

The Waste Treatment Plant has been designed based on the following parameters.

- Waste generated/ day : 5 kg of food waste
- Purpose of use : Family of 5

3. SCOPE OF WORK

- Design, engineering, procurement, manufacture, supply of 15 kg cow dung /day treatment plant
- 1 Stove and line connection
- Supply of operation and maintenance manuals
- Training of operators at the time of delivery

4. TECHNICAL NOTE

- The design temperature is 20-30^{O}C
- The process carried out is anaerobic digestion
- The design has been prepared based on the Solid waste characteristics which are listed in the design basis
- The tank dimensions are subject to changes during the detailed engineering and layout preparation. However, the volume remains the same
- The treated waste (Liquid Slurry) from the outlet shall be utilized mainly as fertilizer for plants or can be connected to drainage.

1. Technical Details of Biogas

1.	1cumBioGas is	=	0.4 kg LPG (Approximate)
2.	"	=	Firewood 3.10 liter
3.	"	=	Cow dung cake 12.3kg
4.	"	=	Diesel 0.5 liter

2. Technical Details of the Proposed Treatment Plant

a)	Design	:	Anaerobic Digester
b)	Type	:	Vertical type
c)	Capacity of Treatment Plant	:	1.5 Cum
d)	Land required for the Plant	:	1.2X1.2 square meter
e)	Treatment Capacity per day	:	5 kg of food waste

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f) Gas production : 600grams equivalent of LPG

Specifications/Standards:

1. Treatment Capacity - 30-liter waste per day
2. Digester with fiber reinforced plastic for capacity up to10 liter waste
3. Inlet devices for waste with PVC pipe 6" 6 Gauge
4. Rubber hose, stove and control valve with ISI mark
5. Gas holder 4 layered fiber reinforced plastic

Chemical Coating

1. Polyester ISO Resin
2. Polyester ISO Resin Gel coat
3. Glass fiber mat 600E
4. G.I pipe with Gas holder B-CLASS 3" pipe

Center support of GI pipe 4" B-Class (with FRP coating) fixed to base fixed to central beam

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5. THE TECHNOLOGY

Anaerobic fermentation is the technology used in this treatment plant. The anaerobic fermentation technology has been used for years for the production of biogas plant. The technology may be used for industrial as well as municipal wastewaters. Different models have been developed by different countries on the basis of their requirement. This model is balloon system which is adopted all over the world.

The Process

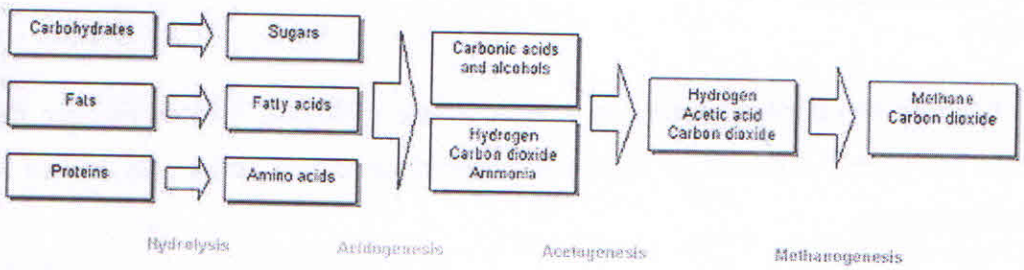
There are a number of microorganisms that are involved in the process of anaerobic digestion including acetic acid-forming bacteria and methane-forming methanogens. These organisms feed upon the initial feedstock (cow dung and previous slurry), which undergoes a number of different processes converting it to intermediate molecules including sugars, hydrogen, and acetic acid, before finally being converted to biogas.

Different species of bacteria are able to survive at different temperature ranges. Ones living optimally at temperatures between35–40°C are called mesophiles or mesophilic bacteria. Some of the bacteria can survive at the hotter and more hostile conditions of 55–60°C, these are called thermophiles or thermophilic bacteria. Methanogens come from the domain of archaea. This family includes species that can grow in the hostile conditions of hydrothermal vents. These species are more resistant to heat and can therefore operate at high temperatures, a property that is unique to thermophiles.

As with aerobic systems the bacteria in anaerobic systems the growing and reproducing microorganisms within them require a source of elemental oxygen to survive. In an anaerobic system there is an absence of gaseous oxygen. Gaseous oxygen is prevented from entering the system through physical containment in sealed tanks. Anaerobes access oxygen from sources other than the surrounding air. The oxygen source for these microorganisms can be the organic material

itself or alternatively may be supplied by inorganic oxides from within the input material. When the oxygen source in an anaerobic system is derived from the organic material itself, then the 'intermediate' end products are primarily alcohols, aldehydes, and organic acids plus carbon dioxide. In the presence of specialized methanogens, the intermediates are converted to the 'final' end products of methane, carbon dioxide with trace levels of hydrogen Sulfide. In an anaerobic system the majority of the chemical energy contained within the starting material is released by methanogenic bacteria as methane.

Populations of anaerobic microorganisms typically take a significant period of time to establish themselves to be fully effective. It is therefore common practice to introduce anaerobic microorganisms from materials with existing populations, a process known as "seeding" the digesters, and typically takes place with the addition of sewage sludge or cattle slurry.



The Key Process Stages of Anaerobic Digestion

There are four key biological and chemical stages of anaerobic digestion:

1. Hydrolysis
2. Acidogenesis
3. Acetogenesis
4. Methanogenesis

In most cases biomass is made up of large organic polymers. In order for the bacteria in anaerobic digesters to access the energy potential of the material, these chains must first be broken down into

their smaller constituent parts. These constituent parts or monomers such as sugars are readily available by other bacteria. The process of breaking these chains and dissolving the smaller molecules into solution is called hydrolysis. Therefore, hydrolysis of these high molecular weight polymeric components is the necessary first step in anaerobic digestion. Through hydrolysis the complex organic molecules are broken down into simple sugars, amino acids, and fatty acids.

Acetate and hydrogen produced in the first stages can be used directly by methanogens. Other molecules such as volatile fatty acids (VFA's) with a chain length that is greater than acetate must first be catabolized into compounds that can be directly utilized by methanogens.

The biological process of acidogenesis is where there is further breakdown of the remaining components by acidogenic (fermentative) bacteria. Here VFAs are created along with ammonia, carbon dioxide and hydrogen sulfide as well as other by-products. The process of acidogenesis is similar to the way that milk sours.

The third stage anaerobic digestion is acetogenesis. Here simple molecules created through the acidogenesis phase are further digested by acetogens to produce largely acetic acid as well as carbon dioxide and hydrogen.

The terminal stage of anaerobic digestion is the biological process of methanogenesis. Here methanogens utilize the intermediate products of the preceding stages and convert them into methane, carbon dioxide and water. It is these components that makes up the majority of the biogas emitted from the system. Methanogenesis is sensitive to both high and low pHs and occurs between pH 6.5andpH 8. The remaining, non-digestible material which the microbes cannot feed upon, along with any dead bacterial remains constitutes the digestate. Biogas is the ultimate waste product of the bacteria feeding off the input biodegradable feedstock, and is mostly methane and carbon dioxide, with a small amount hydrogen and trace hydrogen sulfide. (As produced, biogas also contains water vapor, with the fractional water vapor volume a

Function of biogas temperature). Most of the biogas is produced during the middle of the digestion, after the bacterial population has grown, and tapers off as the put risible material is exhausted. The gas is normally stored on top of the digester in an inflatable gas bubble or extracted and stored next to the facility in a gas holder.

Typical Composition Of Biogas	
Matter	**%**
Methane, CH_4	50-75
Carbon dioxide, CO_2	25-50
Nitrogen, N_2	0-10
Hydrogen, H_2	0-1
Hydrogen sulphide, H_2S	0-3
Oxygen, O_2	0-2

6. ADVANTAGES OF KVIC Model

ROBUSTNESS AND OPERATIONAL RELIABILTY

1. Stable under large load variations
2. Tolerant to disturbances
3. Recovery very quickly after major upsets
4. No Clogging of reactors
5. No risk of Sludge Bulking
6. Excellent Strength to retain high pressure of Gas
7. Expert Fabrication
8. Customized Design & Fabrication
9. Long Life
10. Cost Effective
11. Easy Maintenance

FLEXIBILITY

1. Wide range of bio waste can be utilised
2. Suitable for lands with any type geographical features

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7. PROCESS DESCRIPTION

The proposed system consists of following stages:

Feeding at the Inlet tank

Inlet tank is connected to the digester. The feeding process is carried out through inlet. This feed directly enters to the digester where the anaerobic digestion takes place.

Treatment inside the Digestion Chamber

The digester mainly consists of a digestion chamber and a gas holder. The feed directly enters the digester where the reaction carried out is an anaerobic digestion (in the absence of oxygen). The size of the digester is designed on the basis of type of waste and quantity of waste. Only the waste which completes its HRT (Hydraulic Retention Time) will be coming out of the digester as slurry. As the part of digestion methane gas will be formed which will be collected in the gas holder.

Slurry Pumping at the Outlet Tank

Digester is connected to an outlet tank in which slurry can be collected. This slurry can be directly used or can be connected to drainage.

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8. LIST OF EXCLUSIONS

- Material storage at site
- Safety of equipment at site
- Water and power for erection
- Collection and disposal of slurry from outlet to the drainage
- Statutory approvals required if any
- Table space for our engineer
- Customer should arrange plumber at the time of installation

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9. PRICE & COMMERCIAL TERMS

Biogas digester

Biogas digester with gas connection	40,000
Total	**40,000**

INCLUDING 12 % OF GST AND TRANSPORTATION

(Forty-two thousand only)

We offer to design, engineering, manufacture, supply and commissioning of 30-liter food waste treatment plant as described herein our offer for a total price of.

(Forty-two thousand only)

1-3-23

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Terms of Payment:

1. 100% advance payment at the time of placing order

The amount may be paid in Cheque or DD, in favor of The Synod Bioscience

Note: Biogas products will take almost 5-10 days for initial biogas production depending upon quality of cow dung, climatic condition.

- **Customer should Arrange cow dung and labor**

Delivery:

8 to 10 days from the date of receipt of your firm order along with advance.

Validity:

This offer is open and valid for acceptance for a period of 1 month from the date of this document.

Warranty:

One-year free warranty will be given from the date of commissioning the plant. On completion of one year, charges will be collected from the beneficiary then and there Or Annual Maintenance Contract will be undertaken by **The Synod Bioscience** on mutually agreed terms and conditions.

If the beneficiary put more than prescribed quantity of Solid waste in plant per day, **Synod Bioscience** no way responsible for non-functioning and any complaint due to over feeding. **Synod Bioscience** is not responsible for any external damages or damages due to any natural calamities.

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