

Biogas Practical 2.

Aim: To make you aware of how to use and improve the efficiency of a biogas plant.

Objective: To fill and monitor the biogas plant over the period of one year.

Material needed: Fresh dung, water, meter tape, calculator, pen, paper.

Let's get started!



Procedure:-

- 1) Mix fresh dung and water with equal proportions in the Inlet. If the dung is dry and falls apart easily in your hands add some extra water.



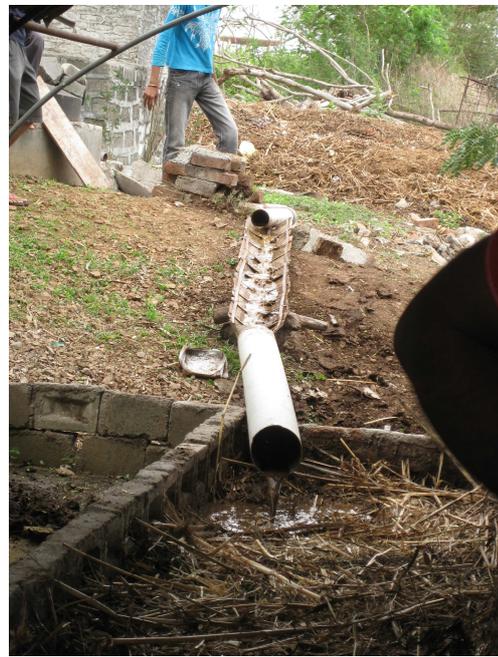


2) Stir the mixture together until you get an even consistency.
(<< double click to watch a short video clip)

3) Once you have an even runny consistency you can remove the lid to allow the liquid to flow through the hole and into the digester.



4) The digester has an overflow pipe so that the sludge can run out into a drainage pipe that takes it away to be turned into fertiliser. Watch as the sludge makes its way along this pipe.



- 5) To make the fertilizer we need a large container filled with straw. Using a rake mix the straw and sludge together making sure that everywhere has an even mix. After 62-65 days the mixture will look like dark soil.
- 6) Using a spade shovel the dark material into a container containing worms, these will aerate the soil turning it into fertilizer. You will end up with fertilizer that looks like this. It can then be sold.



- 7) Continue the above procedure everyday throughout the summer, winter and rainy season.
- 8) Observe the production of gas during feed period. Make a table in your notebook that looks like this:

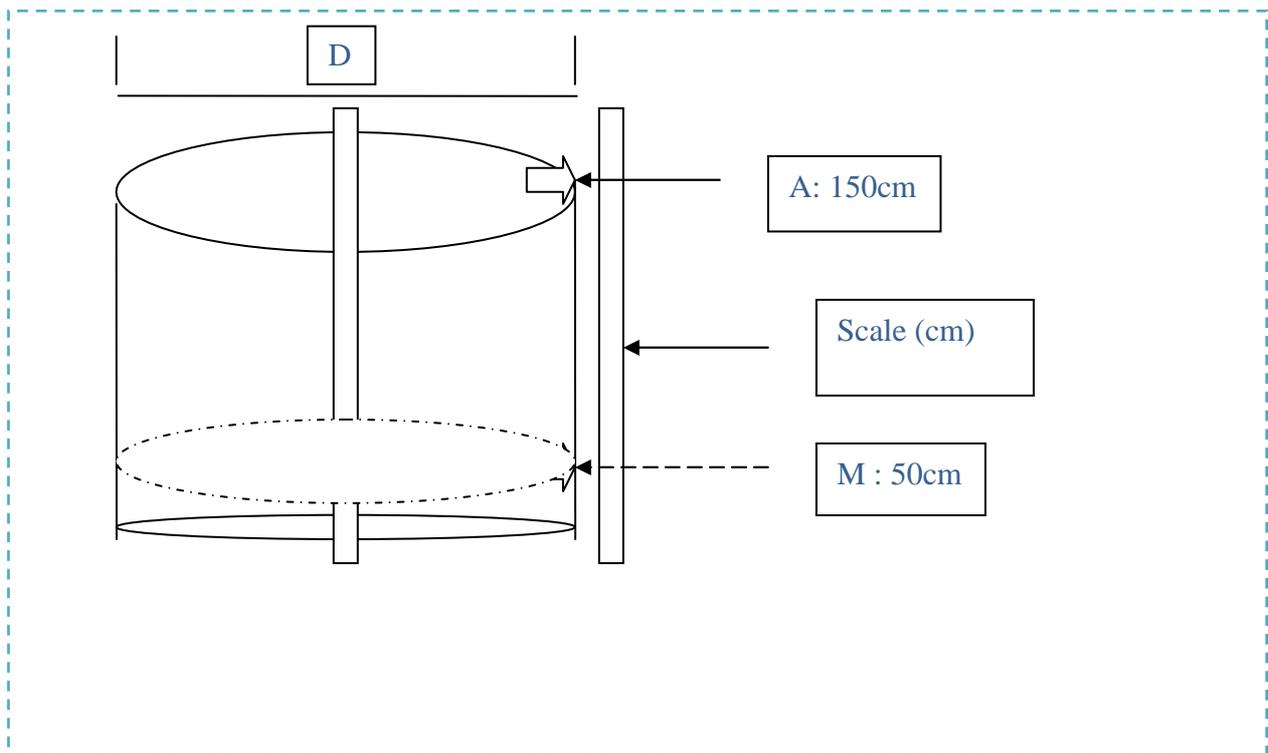
Date	Volume of dung added (kg)	Volume of water added (L)	Position of gas tank before feed (m)	Position of gas tank after feed (m)	Volume of gas generated (m^3)

The first columns are easy to fill out. We have to use some maths to work out the final column. Follow my example below and you will be able to fill out your table in no time!





Using the measuring stick next to the gas holder note down the reading before and after every feeding, and enter these numbers into columns 4 and 5.



The diameter of gas tank is labeled **D**. To work out the area of gas we use this equation:

$$\text{Area of gas tank} = (3.14 \times D^2) / 4$$

So for example if we assume that our diameter is 1m then the area of the gas tank is

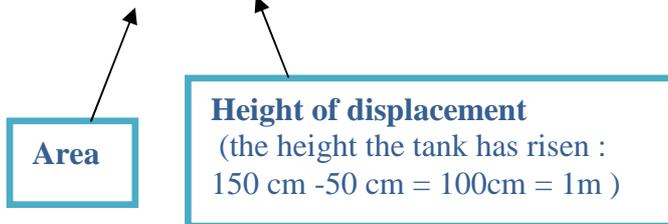
$$= (3.14 \times 1 \times 1) / 4 = 0.785 \text{ m}^2$$

Now lets say, the position of the gas tank in the morning was at position **M**. The reading on the scale is **50 cm**.

After putting in the feed in the evening the position of the tank is at position **A**.
The reading on the scale is **150 cm**.
This means tank has risen by height of **150 cm - 50 cm = 100 cm = 1 m**

The amount (Volume) of gas generated is equal to:
Area X height of displacement

So in our example this is:
 $= 0.785 \times 1 = 0.785 \text{ m}^3$



This number will be entered into our last column.

- 9) Now make an inspection of Biogas plant checking the following points:
- Check the gate valve is only opened when the gas has to be used. This will avoid the unnecessary wastage of gas.
 - Check the inflow of air injector is being adjusted properly.
 - Check to see if the outlet of plant is covered correctly.

It is very important that we maintain the biogas plant to ensure that it continues to work correctly and efficiently. If you follow my maintenance plan then you will be able to make the most gas and fertilizer as possible!



5) Daily Maintenance:-

- Add the recommended quantity of raw material.
- Use proper slurry mixture.
- Use clean feed stock, free from soil and straws.

6) Weekly Maintenance:-

- Use a long bamboo pole for stirring the slurry through the outlet tank.
- Open the tap of the manual moisture trap to drain off moisture condensed in the pipeline.

7) Monthly Maintenance:-

- Check gate valve, gas outlet pipe and gas pipe fittings for leakage.
- Check the pipe of moisture trap (water removal) for any possible leakage.

8) Annually Maintenance:-

- Check for gas and water leaks for pipe and appliances.
- Open the gate valve & remove all the gas from the plant. After this check the level of slurry in the outlet pipe/ chamber.

9) Five Year Maintenance:-

- Empty the plant and clean the sludge & inorganic material from the bottom of plant.
- Repaint the gas storage chamber with black enamel paint.
- Recharge the plant with fresh slurry.

Well done you have finished the practical and should now be confident in filling and monitoring the biogas plant. Here is a set of activities to test your new skills, good luck!



Activities:

1. Find out quantity of biogas required to boil 10ltr of water to 100 degree C also find out quantity of kerosene required to boil 10lits of water. Compare the cost of the two, which one is more expensive?
2. Calculate per m³ cost of biogas
3. If the position of the gas tank before the feed was 20cm and the position after the feed was 160cm. Assume the diameter of the gas tank is 1m. How much gas has been generated?