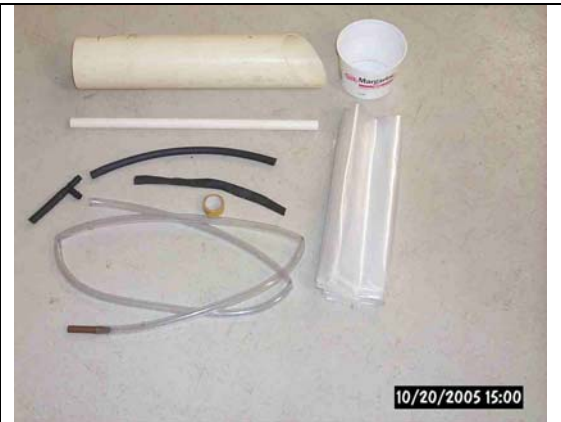


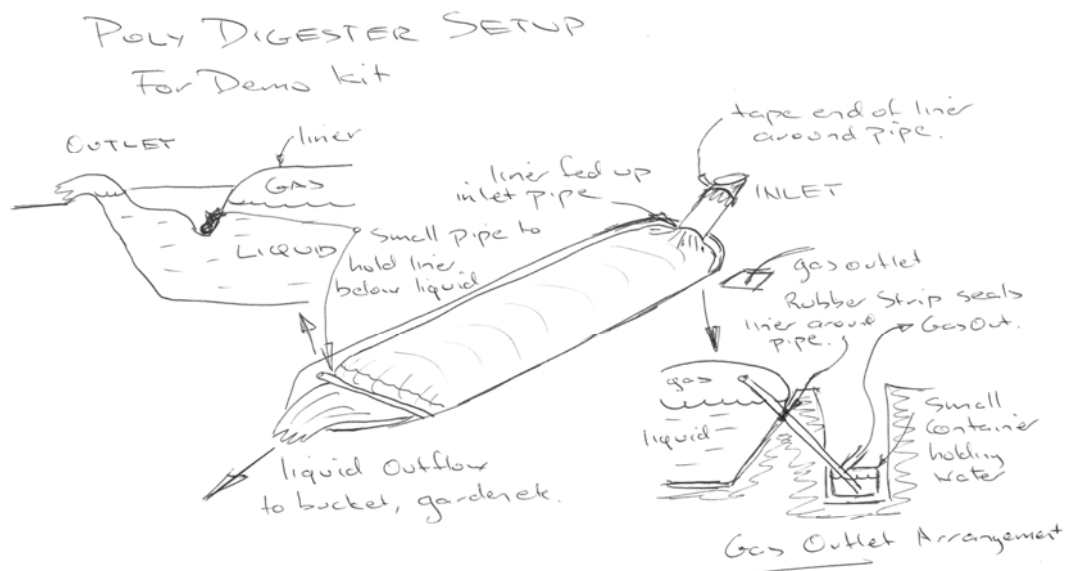
DIY Poly Digester

What is Supplied in the Kit

4 m of clear polyethylene layflat tube
Inlet tube (100mm PVC pipe, 40 cm long)
0.4 m of 19mm dia PVC pipe
0.4 m of 13mm dia black poly tube
2 m of 12 mm dia flexible poly tube
1 13mm poly Tee piece
1 burner
Small plastic container for water trap
Rubber strip
Insulating Tape



Sketch of Arrangement



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29 Sept 2008



Figure 1 The completed digester in Cameroon

What You Need to Supply

A hole in the ground (ie. shovel to dig same!)– 0.9 m top width, 0.3 m deep with 0.3 m bottom width and length to suit digester (see Introduction) with provision for gas outlet and effluent outlet (or some other way of containing the digester, like a trough).

Buckets for loading/unloading

Waste material for digestion

Water

Weight to develop burner pressure

Matches (or other means of igniting gas)

Patience

Scissors and/or sharp knife for cutting plastic and tube

Extras You May Need

Some pieces of wood or bricks to hold back soil?

A fence to keep out animals?

A roof for protection from the sun?

Support for the burner

Container to boil water in

Introduction

The basic concept is that the layflat tube be cut in half (that's half the length, not split down the middle!) and used as a double thickness to make the digester more durable and to have the gas storage in the digester, but you may want a longer (or shorter) digester or a separate gas storage so you may vary the length to suit. Follow the steps below, in order.

For more background information see the "[Beginners Guide to Biogas](#)".

The Hole

Mark out the main hole 0.9 m wide and 2 m long (for the standard digester) and excavate to 30 cm deep with 1:1 side slopes to give 30 cm bottom width and 1.4 m bottom length, with a level bottom (if you are on a hill put the digester along the contour). At the inlet end, which can be shaped to support the inlet pipe, make a small area in one sidewall to take the gas outlet (you may need some wood or bricks to hold back the soil) and at the outlet end make a hole that the outlet bucket can sit in (more wood/bricks?).



Figure 2 The hole used in Cameroon, a bit deeper than necessary

Ensure that there are NO sharp objects in the hole, so the digester won't get punctured.

The Digester

Lay the plastic layflat tube in the hole and fold the inlet end to facilitate feeding through the inlet pipe. Put some insulating tape around the end if the inlet pipe to protect the poly sheet from sharp edges (see Fig 1 below). Once the poly is through the inlet pipe fold the end back, trim excess sheet and tape as in Fig 2 below. Lay the inlet pipe on the bank of the hole and support with some soil if necessary.

DIY Poly Digester Instructions



Fig 1 – Folded layflat tube



Fig 2 Inlet completed

To construct the gas outlet make a small hole in one of the folds of plastic near the inlet pipe, push the black poly pipe through so the end will sit above water level (the hole should be below final water level) and wrap the area tightly with rubber strip, as in Fig 3, and hold rubber in place with insulating tape.

Spread the layflat tube out in the trench, making sure it is properly centred and the base is laid out flat. It may help to put a couple of centimetres of water in the digester at this point (It will also stop the plastic blowing away!).



Fig 3 – Gas outlet tube

At the outlet end arrange the PVC pipe so the plastic sheet fed under the pipe will be below liquid level. The bottom of the plastic sheet must rise higher than the bottom of the PVC pipe by at least 50 mm (2") to hold the operating gas pressure. The operating level in the digester will be lower than the outflow level by the amount of pressure in the digester and the inlet pipe end needs to be a little higher than the outflow level.

The last thing to do in construction is to put the tee in the end of the poly pipe (you may be able to cut 100 mm (3") off the black poly pipe first, or use 100 mm of flexible pipe on the other end of the tee) and the flexible poly pipe on the middle of the tee. You now need to arrange the small container so the short piece of pipe sits in it as a water drain point (and to relieve excess pressure!) and fill the container up to the tee junction with water (to keep gas in the digester). Put the free end of the flexible pipe into the small container as well, making sure the end will stay fully submerged, to stop gas escaping.

Testing

At this stage you may like to fill the digester with enough water to seal the inlet and outlet pipes. You can then inflate the digester and check for gas and water leaks and make sure the gas outlet is functional. A motorcycle exhaust has been suggested for inflating (just make sure the gas has cooled, by running the connection tube through some water) but an air compressor, hand pump or just your lungs will do the trick. Soapy water is a good way of finding gas leaks, as you may need to do if damage occurs during operation. If you are unfortunate enough to have a leak just dry the area and apply an “insulating tape” patch. It is much more pleasant doing this with water rather than effluent in the digester, so an initial test is recommended.

Filling

Now you can fill the digester to operating level with effluent. If you are using poultry manure, kitchen scraps or any waste that may not have methanogens present you will need to add some inoculum as well – cattle or pig manure will be fine, or you may be able to get some sludge from another anaerobic digester (maybe your sewerage works).

Once filled you will need some patience, as it will be at least a few days before you get much gas and the first gas will be mainly carbon dioxide, so won't burn. Let the digester get going properly before commencing feeding, perhaps this will take a week or two (depending on operating temperature and how many bacteria were introduced).

Burning Biogas

When you want to try the “biogas” being produced you may need to place some weight on the gas storage (probably the digester itself) to develop about 2 cm (1”) water pressure – if you hold the flexible tube end about this far below the water surface gas will bubble out. If the digester has built up its own pressure by pushing effluent out weights will not be needed.

Push the copper “burner” into the end of the flexible tube (you can just kink the tube to stop gas flow while you do this), let the gas flow, light a match and see if the gas ignites. If the match blows out you have too much Carbon Dioxide, so let the gas escape and wait a few more days for pressure to build up again. If you have waited a few weeks and still have no flame you probably do not have methanogens, so will have to inoculate the digester and wait a bit longer.

The burner is just a piece of 12mm diameter copper tube (about 10cm long) with the supply end closed down and drilled to 1mm diameter as a gas jet.

Once you are getting enough gas to keep the flame alight 5-10 minutes you may like to see how much water you can heat up.

Feeding

Once you are getting combustible gas you may start feeding waste into the digester. You will only need to add 8 litres (2 gallons) of waste every second day. If you find the biogas is not burning stop feeding the digester until combustible gas is produced again and then reduce the feeding rate – either feed less each time or wait longer between feedings.

DIY Poly Digester Instructions

As you add effluent you should find treated material flowing out the other end, this is very good organic fertiliser.

Next

Now you have an operating digester the rest is your own decision – you may like to vary the type waste treated or the amount fed to the digester to see what happens to biogas production, but if you feed too much the gas quality will fall and the flame won't burn properly.

Have fun!