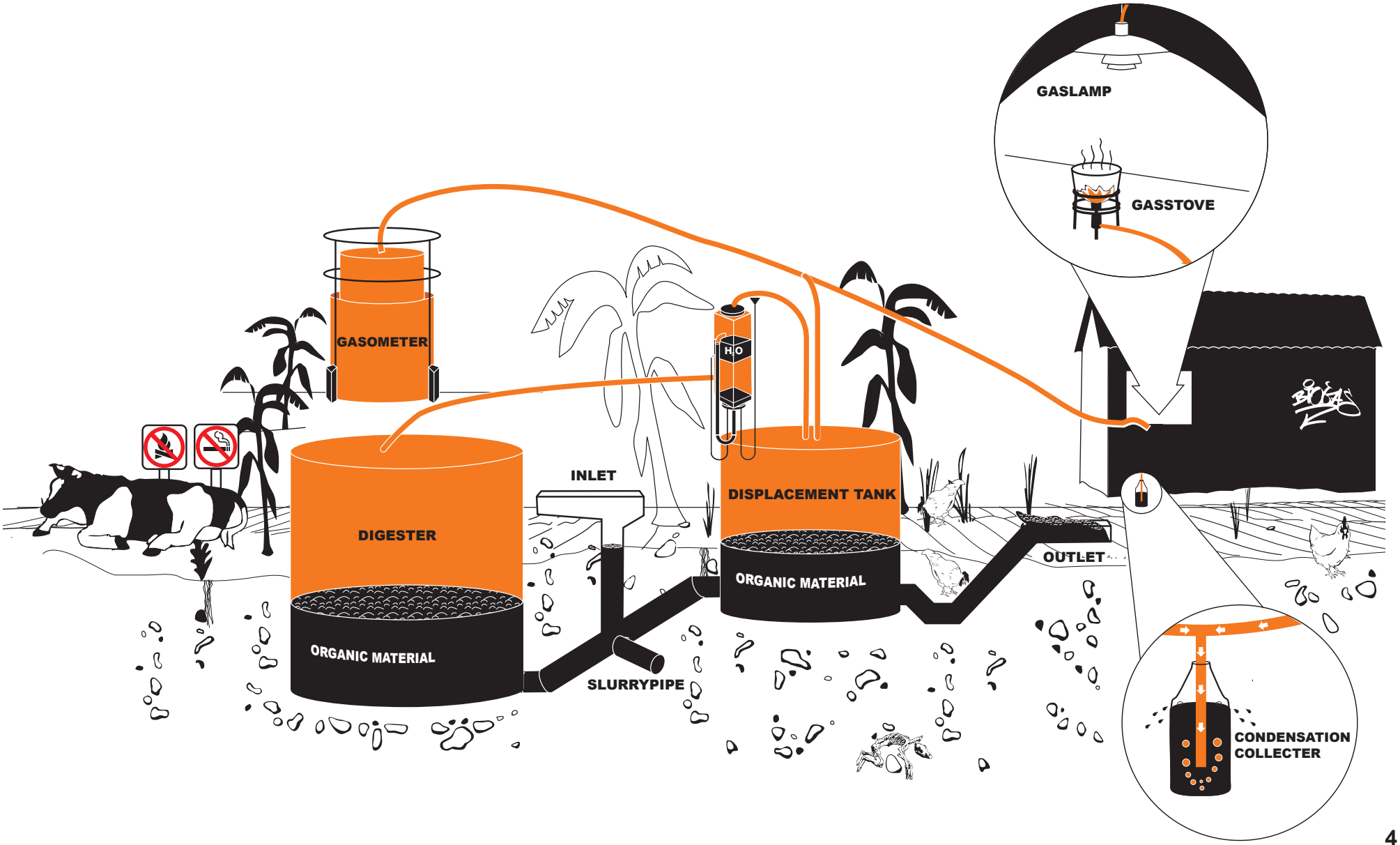
SUPERGAS/ USERS MANUAL

To ensure you get the most out of your new biogas system, this manual will help provide instructions, useful hints, ideas and advice on how to operate and install the biogas unit.

This manual illustrates the overall functionality of the system, how to install and test it and also takes you through the daily routines which will help to maintain the system. Explaining how you should handle your unit and what you should do in case of problems.

CONTENTS/

THE SUPERGAS SYSTEM/



THE SUPERGAS SYSTEM/

The Supergas biogas system is a two chamber system with a hydraulic valve. It consists of an inlet, two water tanks, connecting underground, pipes, an outlet, a hydraulic valve, gasometer, condensation collector and connecting gas pipes. The system has no moving mechanical parts.
It uses only a minimum of water and sludge can be unloaded from the digester while the system is still in use. The hydraulic valve produces an automatic stirring, this stirring mixes old and new organic material and hereby increasing the gas production.
Due to the anaerobe fermentation in the digester, the organic-material coming out of the system has gained in fertilizing value and can improve soil fertility with increased crop output as a result. The act of anaerobe fermentation reduces the chance of pathological transmission of disease from organic waste.

The following is a breakdown of each component and a small summary about the way it functions.

INLET
Inhere you put the organic material.

DIGESTER
This is the first tank, the organic material is kept and here the biogas process begins. This is also where the highest pressure occurs in the system.

DISPLACEMENT TANK
Here the organic material is pushed up from the digester because of the high pressure in the digester. When the material is pushed up it also pushes out a little bit to the outlet.

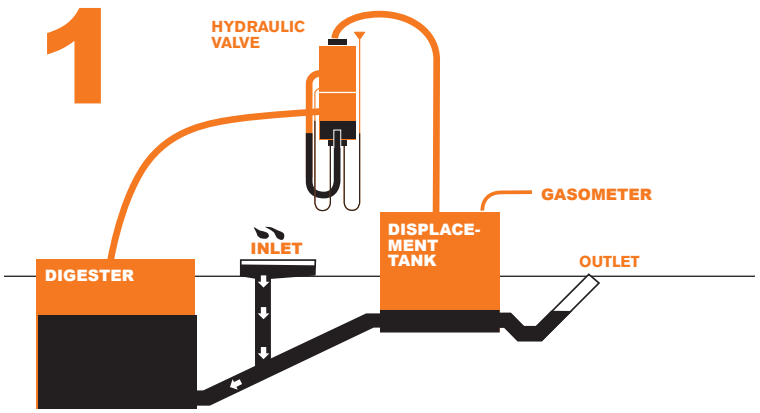
HYDRAULIC VALVE
This is where the gas runs trough from the digester to the displacement tank. Always make sure there is water in the valve. Because of the process in the digester, pressure builds up and at a certain level the valve opens and the gas escape from the digester to the displacement tank.

GASOMETER
This is your gas storage. It consists of two tanks one inside the other. The inner tank moves up and down according to the gas production. The weight on top of the tank makes sure there always is the pressure to provide gas in your kitchen. The higher up the inner tank is the more gas is available.

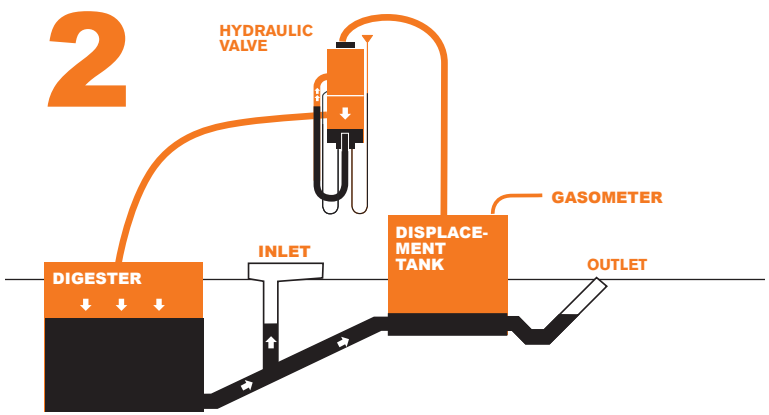
CONDENSATION COLLECTOR
This can collects water from the pipelines. The holes in it make sure the water wont overflow.

OUTLET
Every now and then a little bit of organic material is pushed out from the outlet. This “used” organic material is a very rich fertilizer than should be used in the field for improvement of crop production.

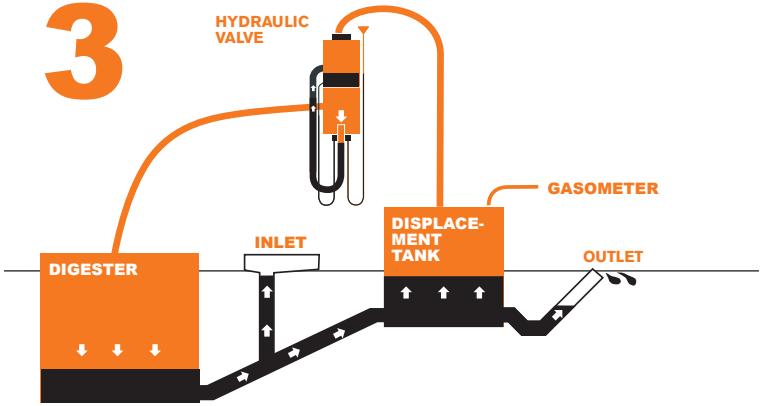
THE SUPERGAS SYSTEM/ THE PROCESS



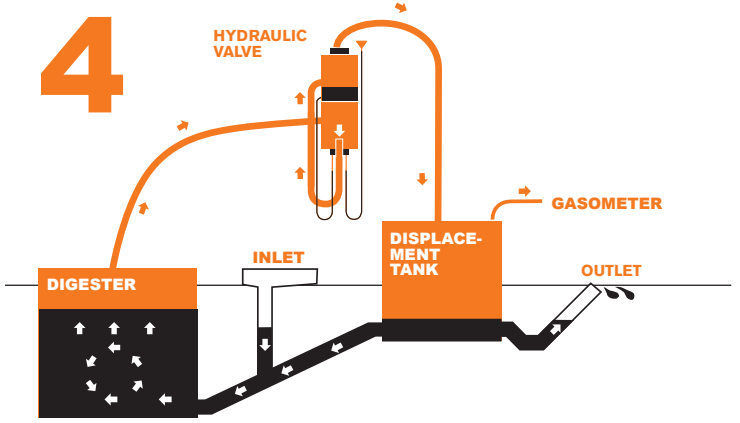
Organic material such as cow dung is deposited in the biogas systems inlet once or twice a day.



The biogas production builds up pressure inside the digester and forces a portion of the organic material up to the displacement tank.



After approximately four hours the pressure reaches a high level and starts to push out a small portion of the material through the outlet. This material works very well as fertilizer on the fields. The system is designed to push about 20 percent of the organic material from the reactor up to the displacement tank.



At the high pressure level the hydraulic valve opens and the gas escapes from the digester to the displacement tank. Because of this all the material that has been moved up to the displacement tank will move back to the digester. This stirs the organic material and the old material mixes with the new input. This cycle happens 6-7 times a day so that it is possible to make 2-3 times more gas than in traditional systems.

THE SUPERGAS SYSTEM/ BIOGAS

Biogas typically referred to as bio fuel, is gas produced by the anaerobic digestion or fermentation of organic matter including manure, sewage sludge, municipal solid waste, biodegradable waste or any other biodegradable feedstock, under anaerobic conditions. Biogas is comprised primarily of methane and carbon dioxide.
Biogas production by anaerobic digestion is popular for treating biodegradable waste because valuable fuel can be produced while destroying disease-causing pathogens and reducing the volume of disposed waste products. The methane in biogas combusts more cleanly than coal, and produces more energy with less emissions of carbon dioxide.

Biogas is a highly flammable gas. The gas can also contain poisoning components that in case of direct inhaling can cause serious health problems.

INSTALLATION/ PREPERATION

1

Find the right place to install your Supergas system
Requirements:
A minimum area of approximately 6m x 5m.
Easily accessible from the source of the organic waste.
A safe distance of approximately 20-30m away from the kitchen or from where the gas is to be supplied.
It is also highly recommended that it is a shaded area, if this is not possible shade could be supplied by growing plants and trees or building simple canopies.
Keeping the tanks out of direct sunlight will prolong the lifespan of the system.

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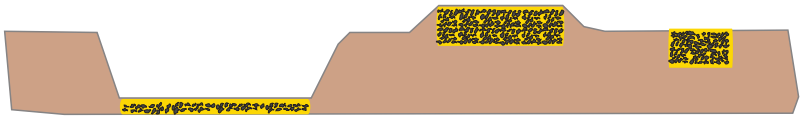

Mark out where the digester and displacement tank will be placed and level the area.
The bottom of the displacement tank must be 105cm higher than the bottom of the digester. The best way to do this is to dig into the ground.
If this is not possible due to groundwater, layers of rock, or other problems which could cause damage to the digester, it will have to be kept at ground level and a mound built to elevate the displacement tank so there is 105cm difference between the two bases.
Sand can be used to provide a stable foundation and give a layer of protection from the ground.

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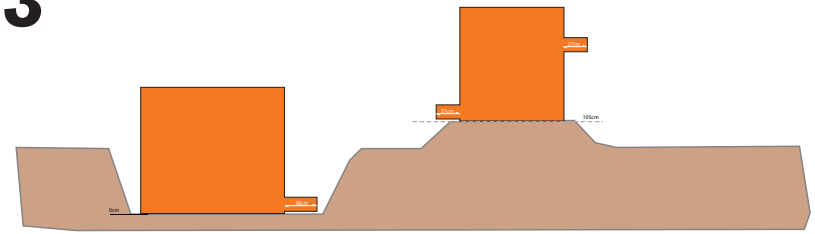
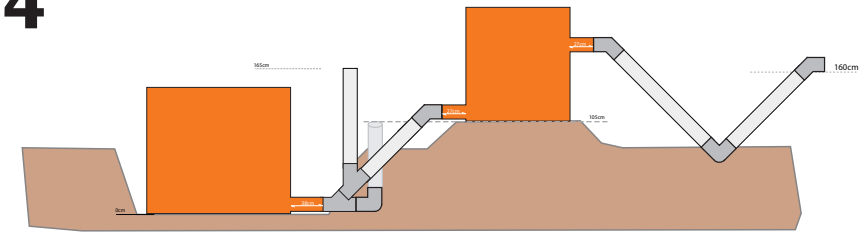


Make sure the spaces for the tanks are level and clean, then place the digester and the displacement tank in their right positions, making sure again they are the correct height apart.
Consider where the gasometer will be placed and that all the pipe connectors are facing the right direction. Also check the length of the pipes that will be used to connect them, ensuring the tanks are not too far apart or too close together.
It is a good idea to dig the hole for the digester about 30cm bigger all around than the size of the tank, this will allow it to be moved if needed.

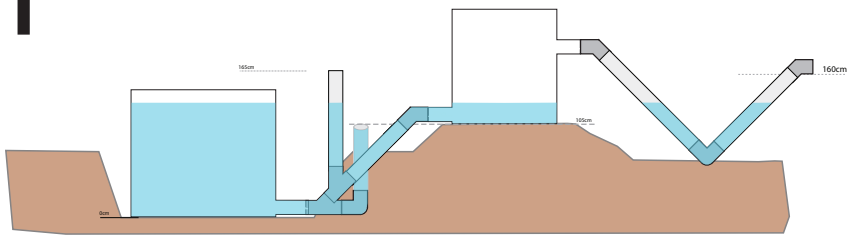
4



Connect the 6 pipes and the inlet, starting from the digester and working toward the displacement tank and outlet.
The pipes should be greased at either end so that they connect to the joints easily and don't damage the rubber coating. The pipes should fit into the joints when
correctly aligned and should not be stressed or forced during assembly.
It is very important to check the height of the inlet and the outlet once this is done. The inlet should be 165cm from the bottom of the digester, and the outlet should be 160cm. The inlet must be higher than the outlet by approximately 5cm.
Make sure also that the slurry pipe is closed off.

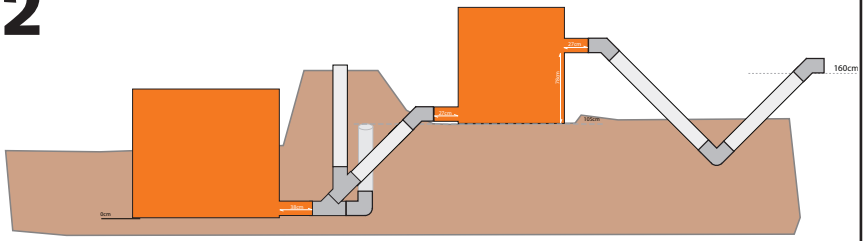
INSTALLATION/ THE TANKS

1



Once the pipes and tanks are connected, check for any leaks in the system by filling it with water through the inlet. There must be enough water to immerse all the piping joints which will be underground.
Water will also have to be put into the outlet to check the joint there which will be underground, do not fill the entire pipe.
When all the joints are covered, record and measure the water level at the inlet, then leave over night. Afterwards check the water level at the inlet again. If there has been a loss of water it means there is a leak somewhere, check for visible signs of leaking and fix immediately. Repeat testing until there are no more leaks.

2



When you are sure the tanks and pipes are all water tight you can begin to cover the system, leaving the water in it. It is especially important to check the components which will be underground for any leaks or stresses to make sure you don't have to dig them up again. Fill in all the space around the digester with earth, leaving only the top half of it out of the ground, cover the piping joint on the outlet to make sure it is stable.
Also cover the majority of the piping of the inlet, but leave a small section of pipe and the entry hole at the top, and then make sure the ground is even.

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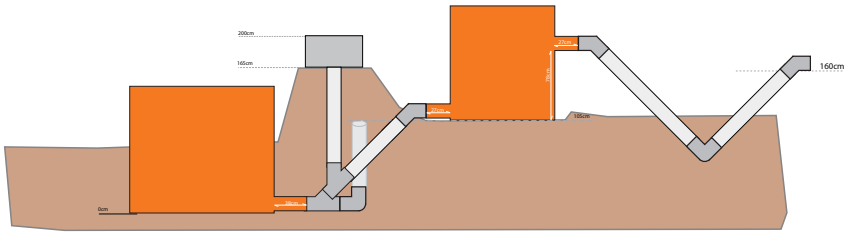

An inlet pit then needs to be created, this will make it easier and cleaner to deposit the organic waste into the system.
The ground at the top should be level and the construction can often be done with concrete. Depending on individual demands and methods of depositing the waste, the inlet can be made as large, high, or long as necessary. The top of the pipe could also be covered by a metal grill to ensure that no large foreign items get through and into the system.

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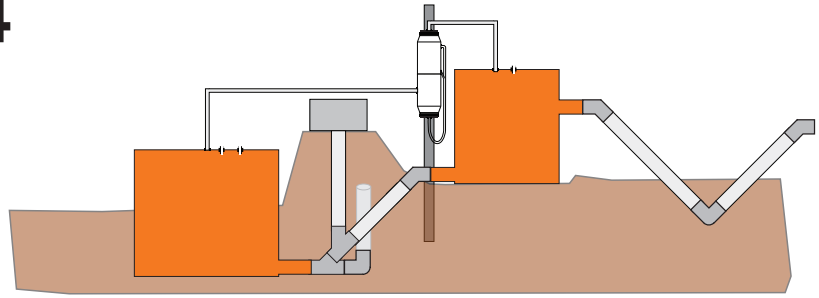
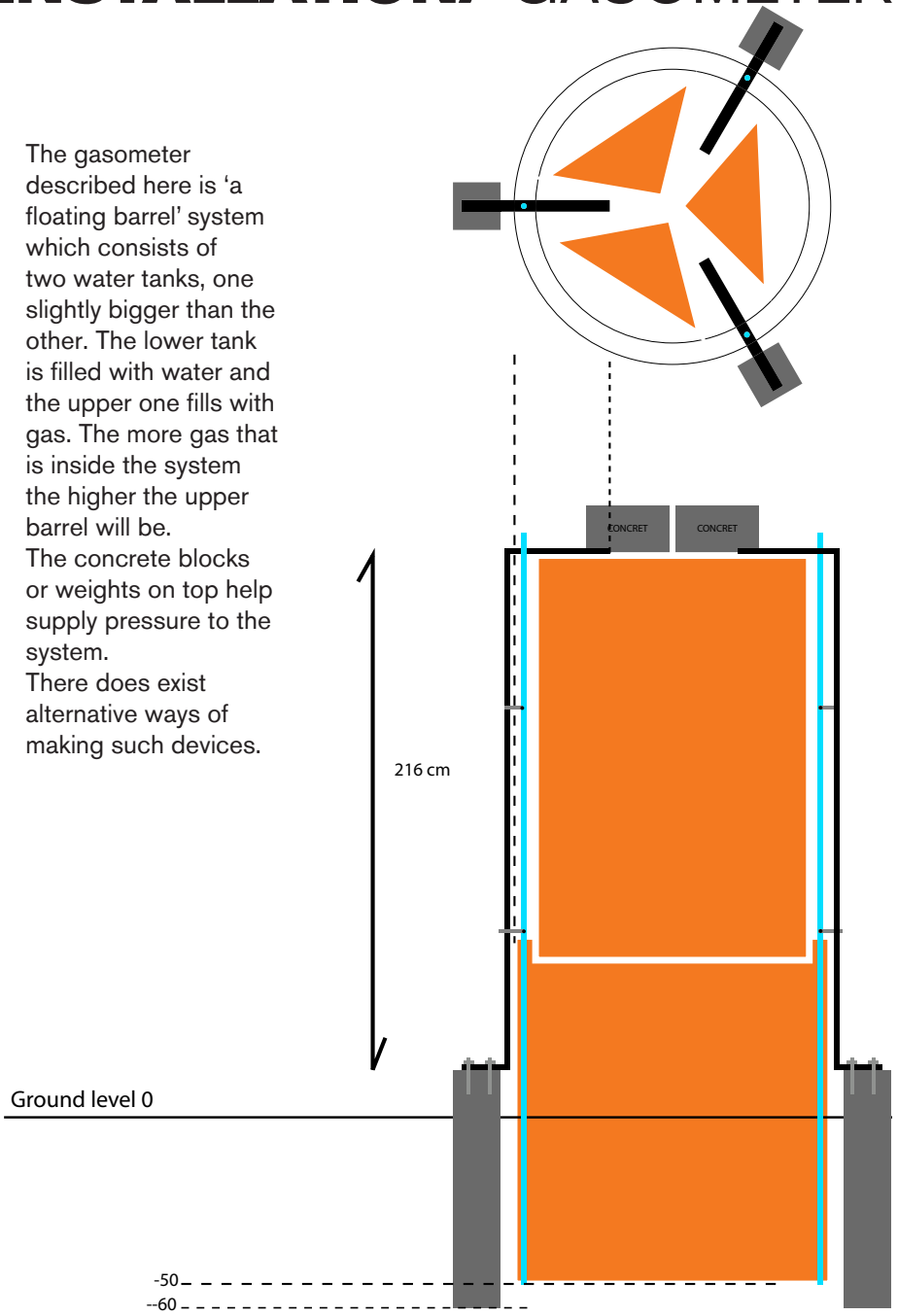


Choose an appropriate location to place the hydraulic valve, it should be close to the displacement tank. Use a concrete pole, approximate dimensions of 10x10x240cm, and dig the pole 80cm deep into the ground. Attach the hydraulic valve to the concrete pole, and make sure there is water in the valve.
Then connect the hydraulic valve to the digester and the displacement tank by carefully cutting all the pipes so they fit exactly. Attach the pipes between the tanks and valve to check it all fits together, Make sure the pipes have no bends or angles where water can get trapped, and are not placed where they may get damaged, only glue when you are certain.

INSTALLATION/ GASOMETER

The gasometer described here is ‘a floating barrel’ system which consists of two water tanks, one slightly bigger than the other. The lower tank is filled with water and the upper one fills with gas. The more gas that is inside the system the higher the upper barrel will be.
The concrete blocks or weights on top help supply pressure to the system.
There does exist alternative ways of making such devices.



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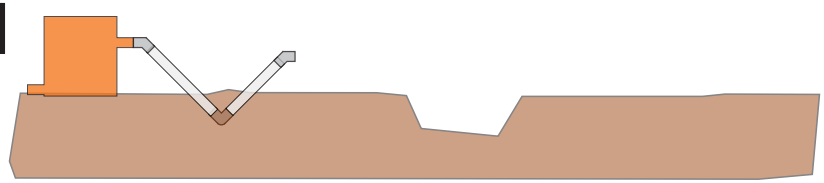

Dig a 50cm deep hole big enough to fit in the gasometer where you have decided to place it. The location should ideally be en-route between the displacement tank and where the gas will be supplied to. This will minimize any flow problems and the amount of piping needed.

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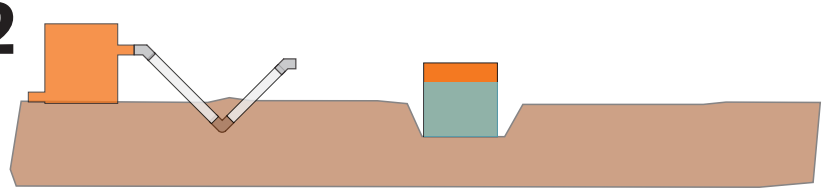

When the hole is dug, make sure the surface within it is clean and level throughout, and place just the lower tank in the hole. Then fill up the lower tank with water, this should allow the the system when complete to move up and down easily.

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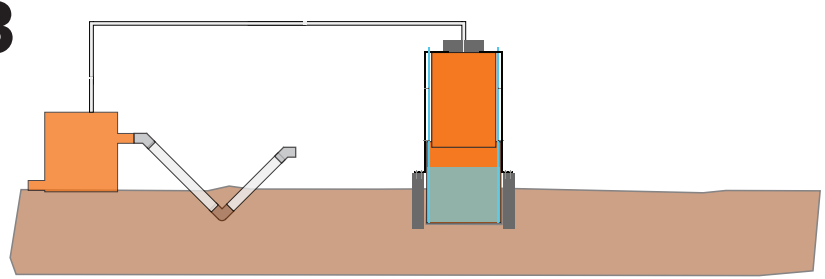
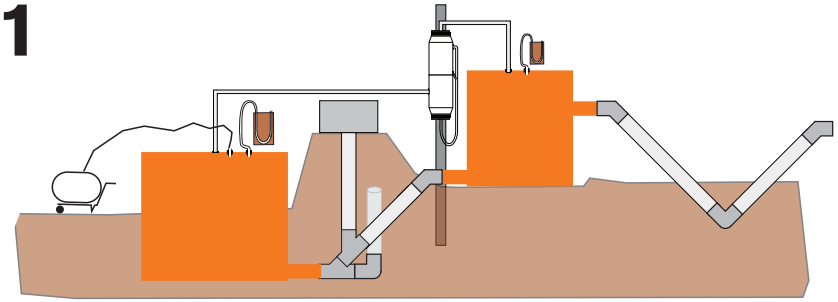


Place the upper tank inside the lower tank and attach the metal casing. Also attach the support poles to the casing and secure in the ground. FIll in the remaining space around the lower tank with earth to secure it, and level the ground around it.
Then place the weights or concrete blocks on top of the upper tank to provide pressure on the system. Once correctly installed, connect the gasometer to the displacement tank by again cutting pipes to the exact dimensions needed, only gluing when you are sure it is right.

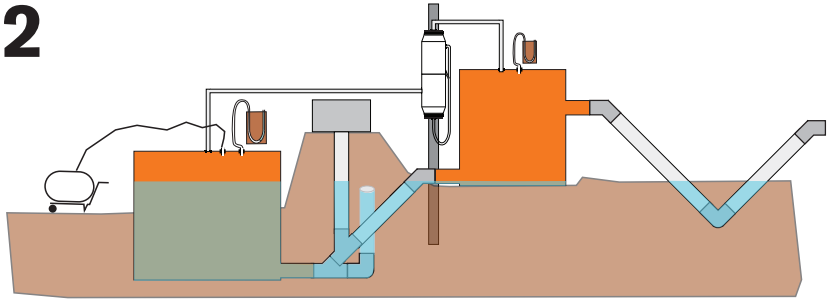
INSTALLATION/ TESTING

1



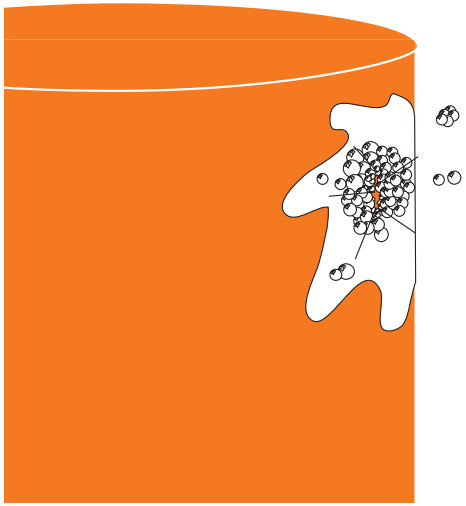
Connect the compressor to the digester, this will be used to test the pressure within the system and check for any leaks or breakages that may occur.
Attach the big and small manometers to the connectors on the tanks. The big manometer should be connected to the digester and the small one should be on the displacement tank.
It is a good idea to have three or more people during this stage, at least one controlling the compressor, one checking the manometers and the other inspecting surfaces for leaks.

2



Make sure there is still enough water within the system, if not fill up the same way as done previously.
Then start the compressor and increase the pressure slowly, any big surges in pressure could cause damage to the system. Continue gradually increasing the pressure, all the while checking the components for signs of leaks or damage and checking the readings on the manometers. The reading on the displacement tank manometer must not go above 15cm, if this happens stop immediately. When the reading on the digester manometer reaches 70cm, stop the pressure.

3



Whilst the pressure is maintained at 70cm in the digester, thoroughly check all surfaces for leaks or stresses. Leaks can be checked for by using water with soap in. Test the tanks and pipes by applying the water over them, if soap bubbles appear then it means there is a leak. These bubbles can be very small so attention is needed.
Leaks should be checked for throughout the course of the testing, and any leaks found should be fixed as quickly as possible.

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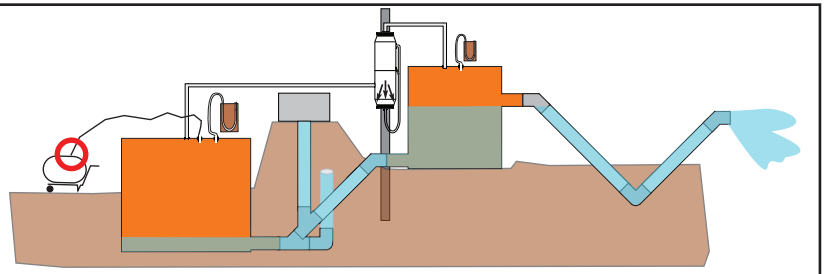
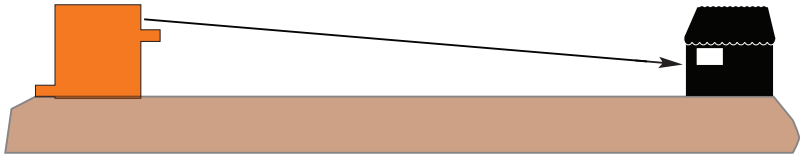


After carrying out any necessary repairs, continue to gradually increase the pressure from the compressor, until the hydraulic valve opens and the pressure is released, it is very important at this point to turn off the compressor immediately. If the hydraulic valve has not opened before the manometer on the digester has reached 90cm the compressor must be stopped and the hydraulic valve checked, at this point some water should have been exiting through the outlet. Repeat this process until the valve has opened 5-6 times, watching the system for any faults. Finally leave the system at a pressure of 70cm (on the digesters manometer) for 24 hours. If there has been any loss of pressure, check for leaks on tanks, connectors, and pipes and then repeat this process.

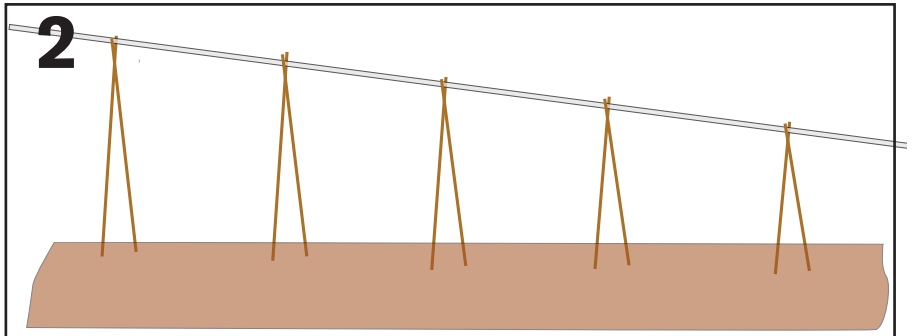
INSTALLATION/ CONNECTING

1



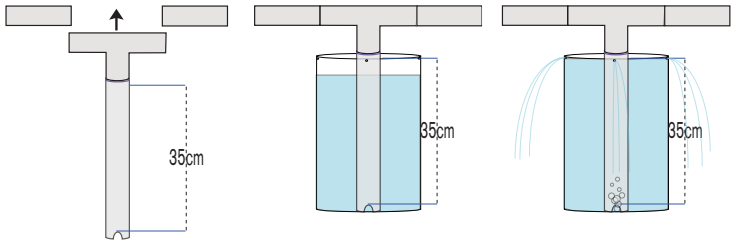
To connect the system, first decide on exactly where it is you want the gas to be supplied. From this point measure the distance to the gasometer to give an idea of how much piping you will need.
Then work out a route from the gasometer to the supply point that is as direct as possible. The pipes will have to be elevated along this path, with the use of sticks or such, so consider this when planning the route.
As well as been elevated the piping should gradually slope from the point it is connected at the system toward the supply point, this is to ensure that any water in the pipes from condensation will run toward the supply point and not toward the system.

2



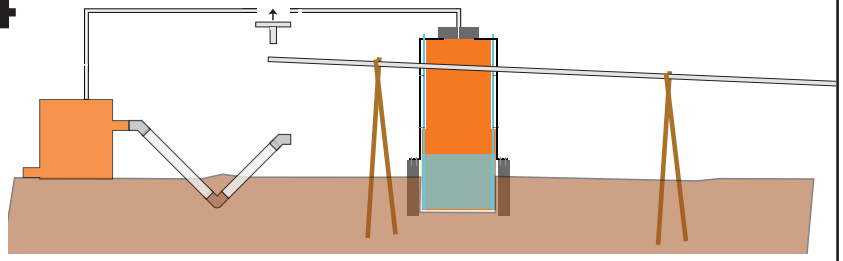
Once the route is decided sticks, or whatever it is that will support the pipes, will need to be put up all the way from one end of the route to the other. This piping will be attached to the system somewhere along the piece of piping which connects the gasometer and the displacement tank. When decided, put your first and highest support there and work toward the supply point in the most direct way possible, gradually shortening the height of the supports. When the supports have all been placed start attaching the pipes from the supply point back toward the gasometer piping, but do not connect it at this point.

3



A condensation collector then needs to be attached. A condensation collector can be made from an old bottle or container. It must be tall enough to have at least 35cm between the bottom of it and the top where some holes must be put in to make sure the water doesn't overflow.
A piece of piping should be cut that will go from the bottom of the container and connect to a 'T' joint piece of piping. The part of the pipe that sits at the bottom of the container should have two small holes in the sides of the piping to allow the gas to escape.
Cut the line of piping and attach the condensation collector as close to the supply point as possible, it should however never be placed indoors.

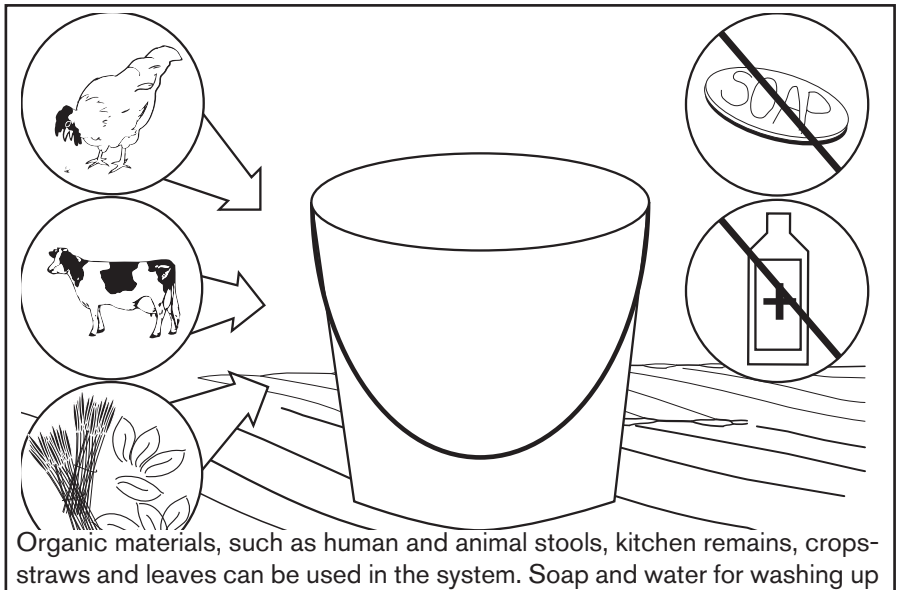
4



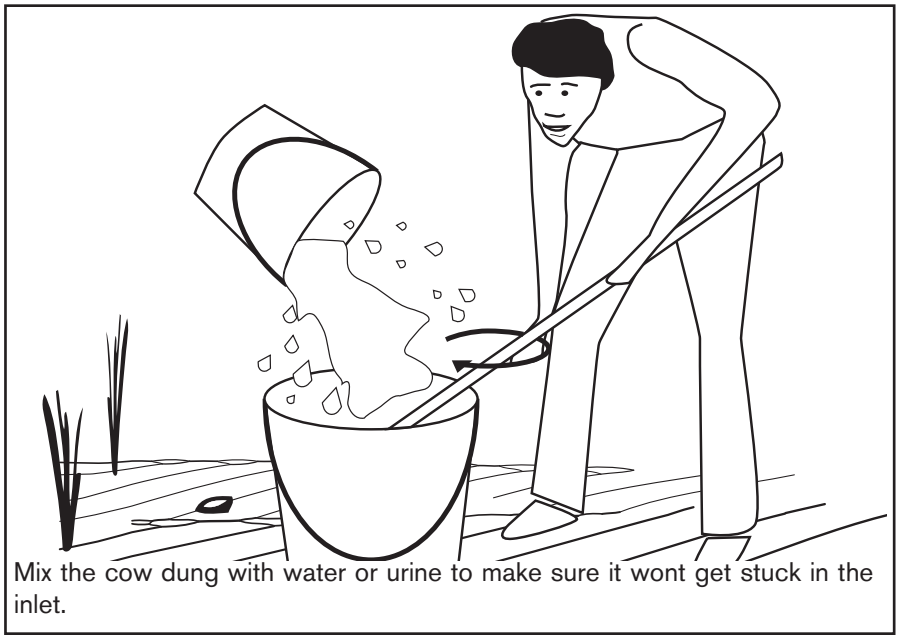
By now you should have piping that leads all the way from the supply point back towards the gasometer and the displacement tank, with a condensation collector by the supply point. Check again that all the piping is connected properly and that there is a gradual slope throughout the route and no places where water could pool. To connect this part to the system cut out a section of the piping between the gasometer and the displacement tank. Carefully measure where to cut and replace this section with a 'T' joint and glue the remaining end of the supply piping to it. When the system is connected to the supply point attach rubber pipes to direct the gas towards appliances and lights at the supply point.

DAILY ROUTINES/

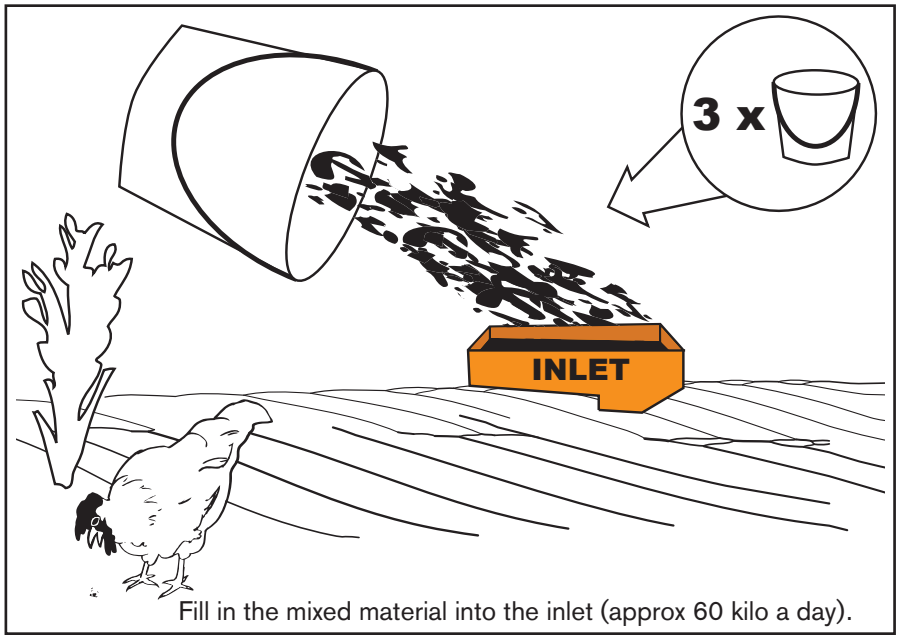
Collect cow dung and urine from the stable.



Organic materials, such as human and animal stools, kitchen remains, crops-straws and leaves can be used in the system. Soap and water for washing up is not good for the system nor is greater amounts of antibiotics.

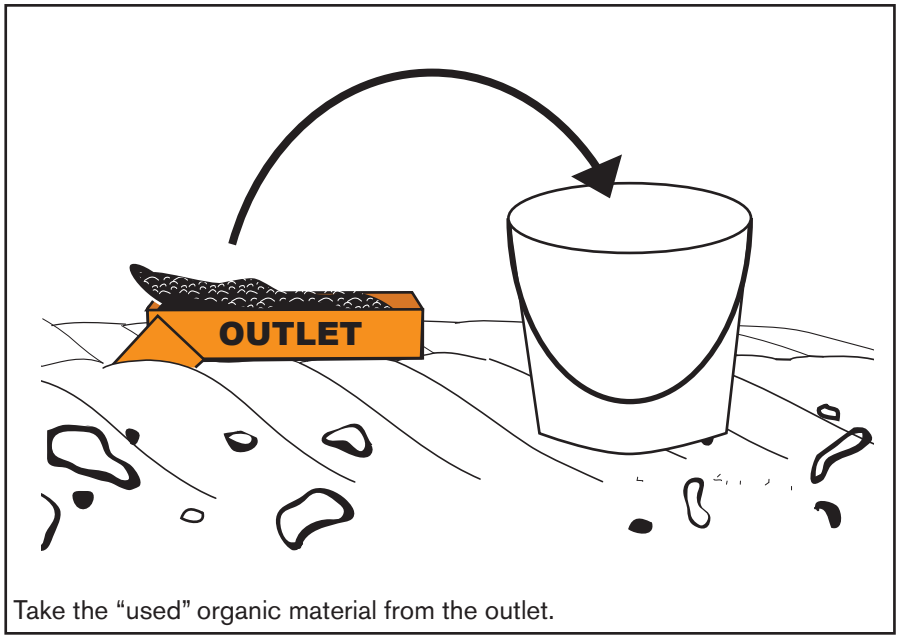


Mix the cow dung with water or urine to make sure it wont get stuck in the inlet.



Fill in the mixed material into the inlet (approx 60 kilo a day).

DAILY ROUTINES/

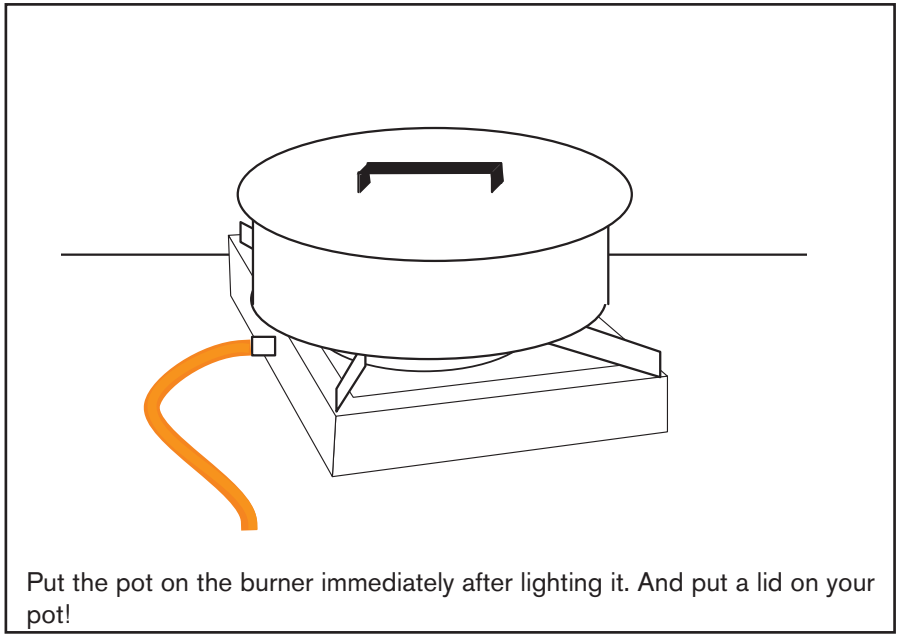


Take the “used” organic material from the outlet.

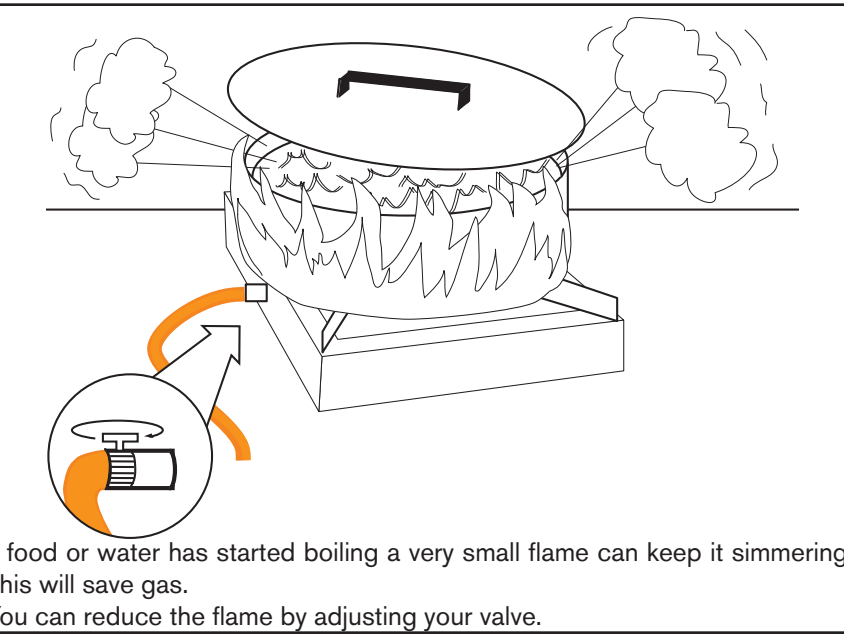
And use it as fertilizer for your vegetables.

DAILY ROUTINES/ KITCHEN

When you are ready for cooking strike a match open the gas valve and light the burner. Make sure always to have matches near.



Put the pot on the burner immediately after lighting it. And put a lid on your pot!

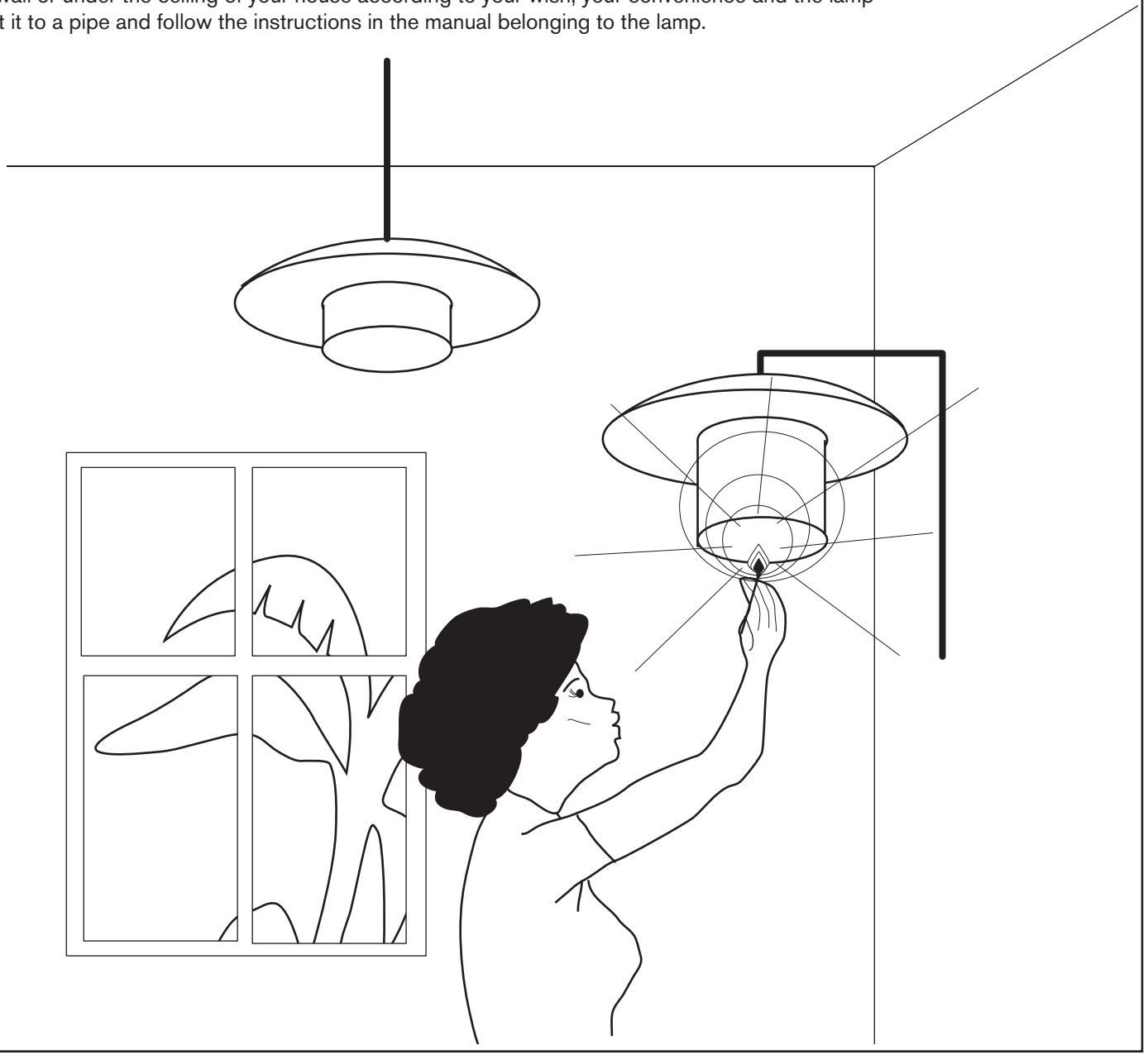


If food or water has started boiling a very small flame can keep it simmering. This will save gas.
You can reduce the flame by adjusting your valve.

Make sure after cooking the gas valve is always closed to avoid losing gas.

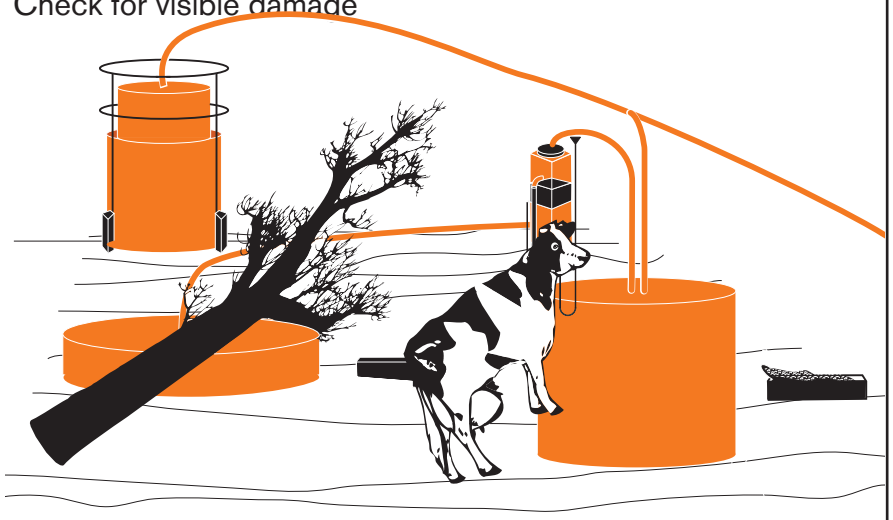
DAILY ROUTINES/ LAMP

The biogas lamp is either placed on a wall or under the ceiling of your house according to your wish, your convenience and the lamp type. When the lamp is placed connect it to a pipe and follow the instructions in the manual belonging to the lamp.



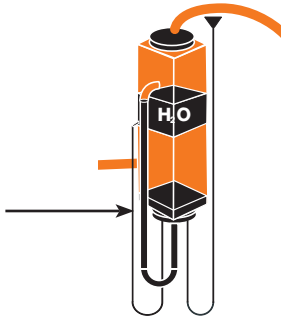
TROUBLESHOOTING/ IF THERE IS NO GAS

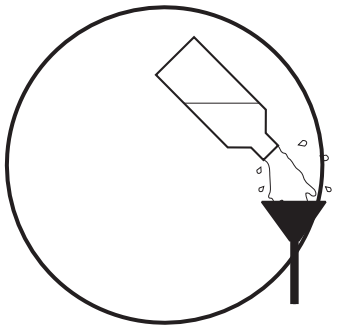
Check for visible damage



Check visible parts for visible damages - it could be a felled tree or damage caused by cattle or others.

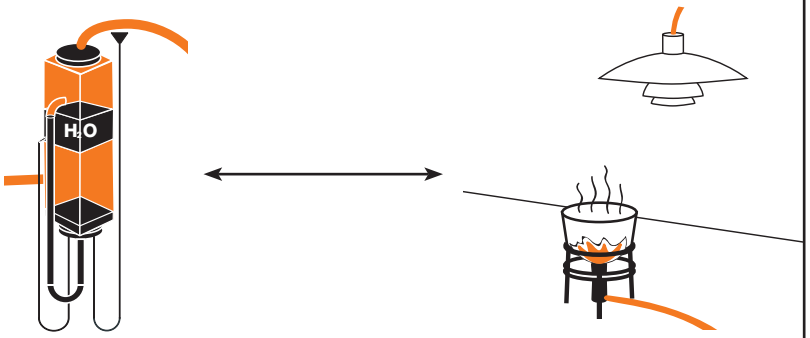
Then check if the hydraulic valve works





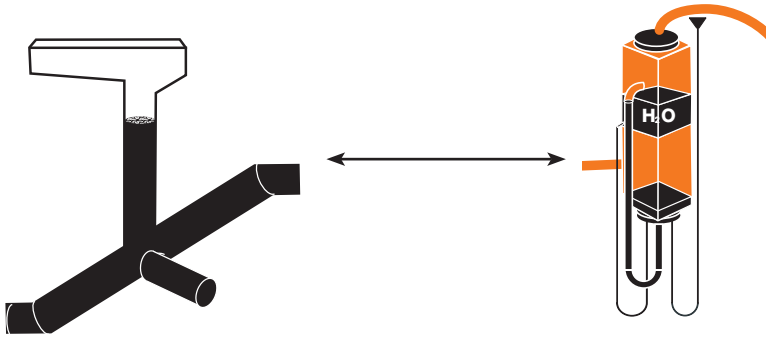
Make sure there is water in the system by observing if water from the lower can surges up to the upper can - if not, fill water in the funnel. You can never fill too much water in the hydraulic valve. Then observe it for a few hours and make sure the process is in function. This can be seen by that the levels of the water in the pipes and the containers changing, eventually also the water blown out from the u-tube.

If hydraulic valve works but theres still problems ...



...the problem is between the hydraulic valve and the kitchen.
Then check if -
1. there is any leak in the displacement tank.
2. there is gas in the gasometer
3. the pipelines or joints (connectors) is leaking

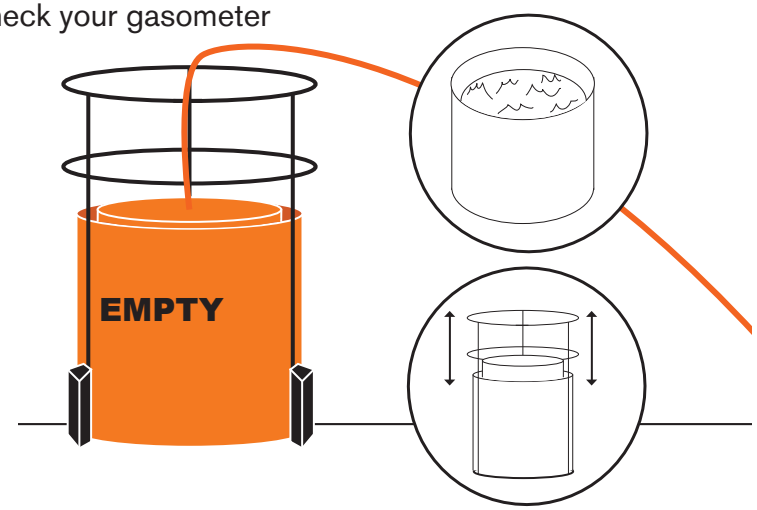
If it doesnt work ...



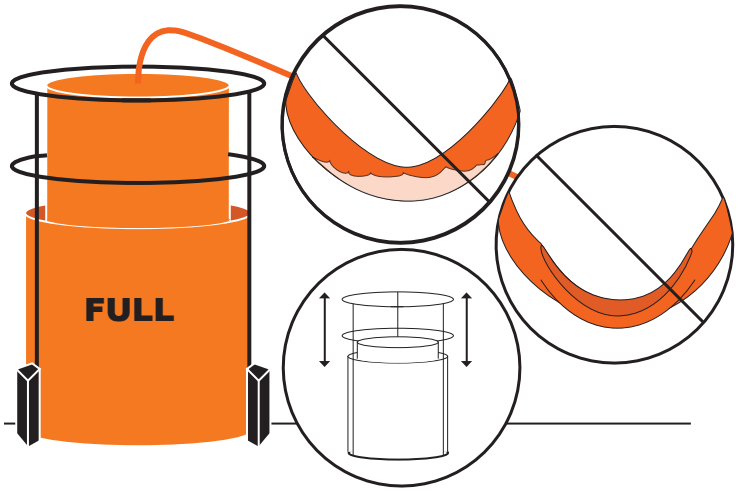
...the problem is between the hydraulic valve and the inlet.
Then check if -
1. the inlet is blocked
2. there is any leak in the digester tank

TROUBLESHOOTING/ IF THERE IS NO GAS

Check your gasometer

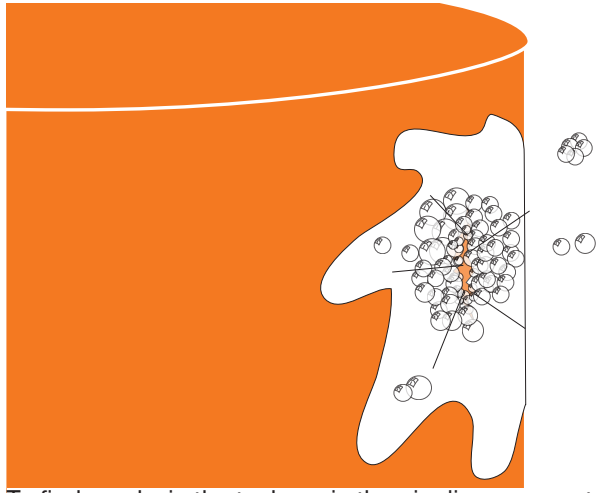


If the tank is at a low level it means there is no gas in it. Check the water level in the lower tank - fill it up if needed. Make sure the inner tank can move up and down easily.



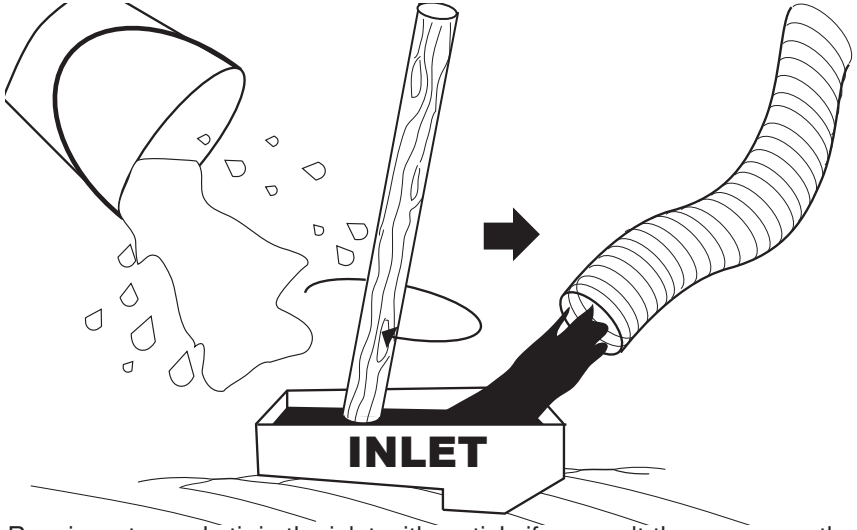
If the tank is full of gas, check the pipe system between the gasometer and the kitchen. Make sure always to run the pipeline with an inclination or else water will be stored. Check no pipes are broken or pinched. Make sure the inner tank can move up and down easily

Check a leak



To find cracks in the tanks or in the pipelines use water with soap and where soap bubble appears there is a leak. The bubbles can be very small so look carefully.

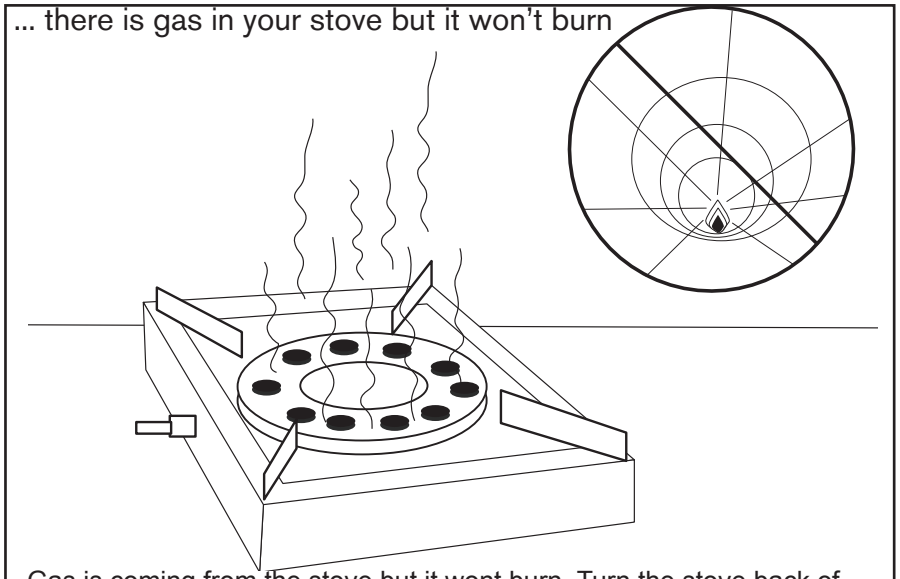
Check if your inlet is blocked



Pour in water and stir in the inlet with a stick, if no result then pump up the organic material and start over again.

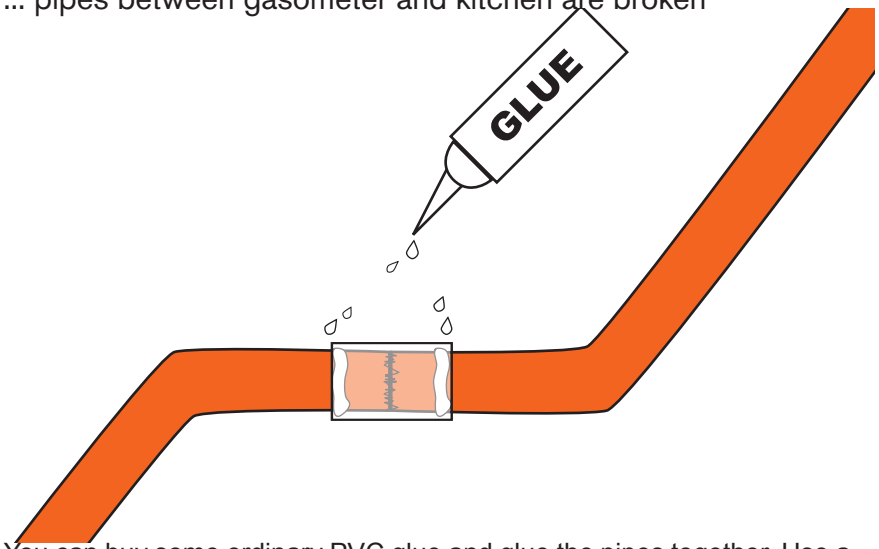
TROUBLESHOOTING/ WHAT TO DO IF...

... there is gas in your stove but it won't burn



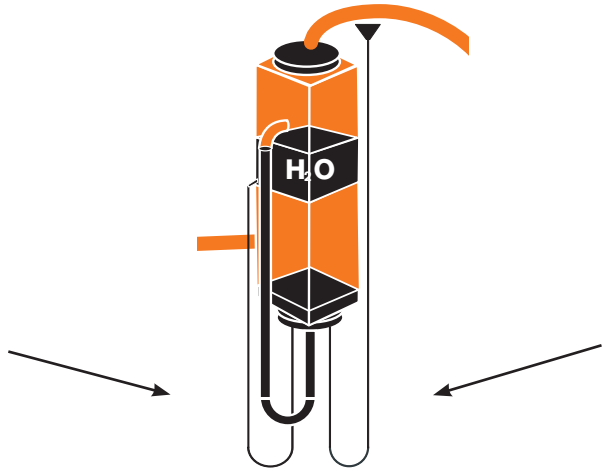
Gas is coming from the stove but it wont burn. Turn the stove back of immediatley, the problem is the gas that has been produced.

... pipes between gasometer and kitchen are broken



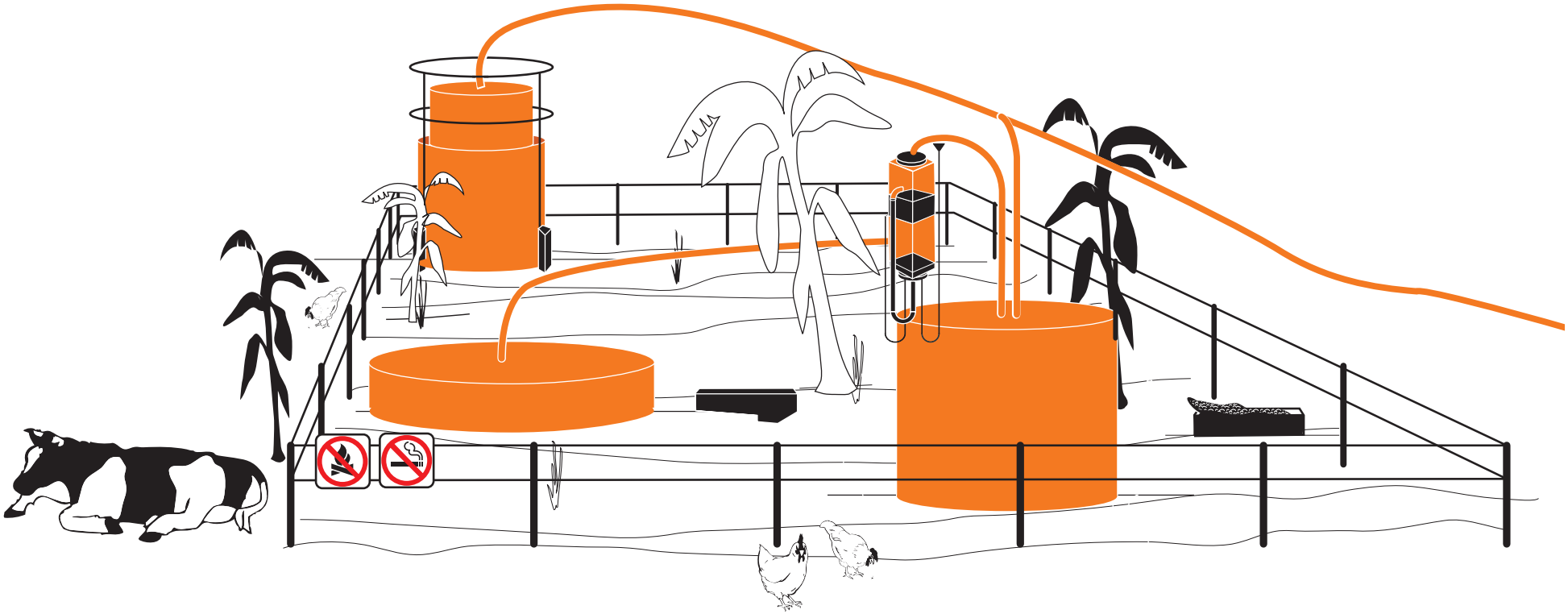
You can buy some ordinary PVC glue and glue the pipes together. Use a fitting and put glue in both ends, press until it is dry.

... the rubber hose is getting porous



Buy a new one and replace it.

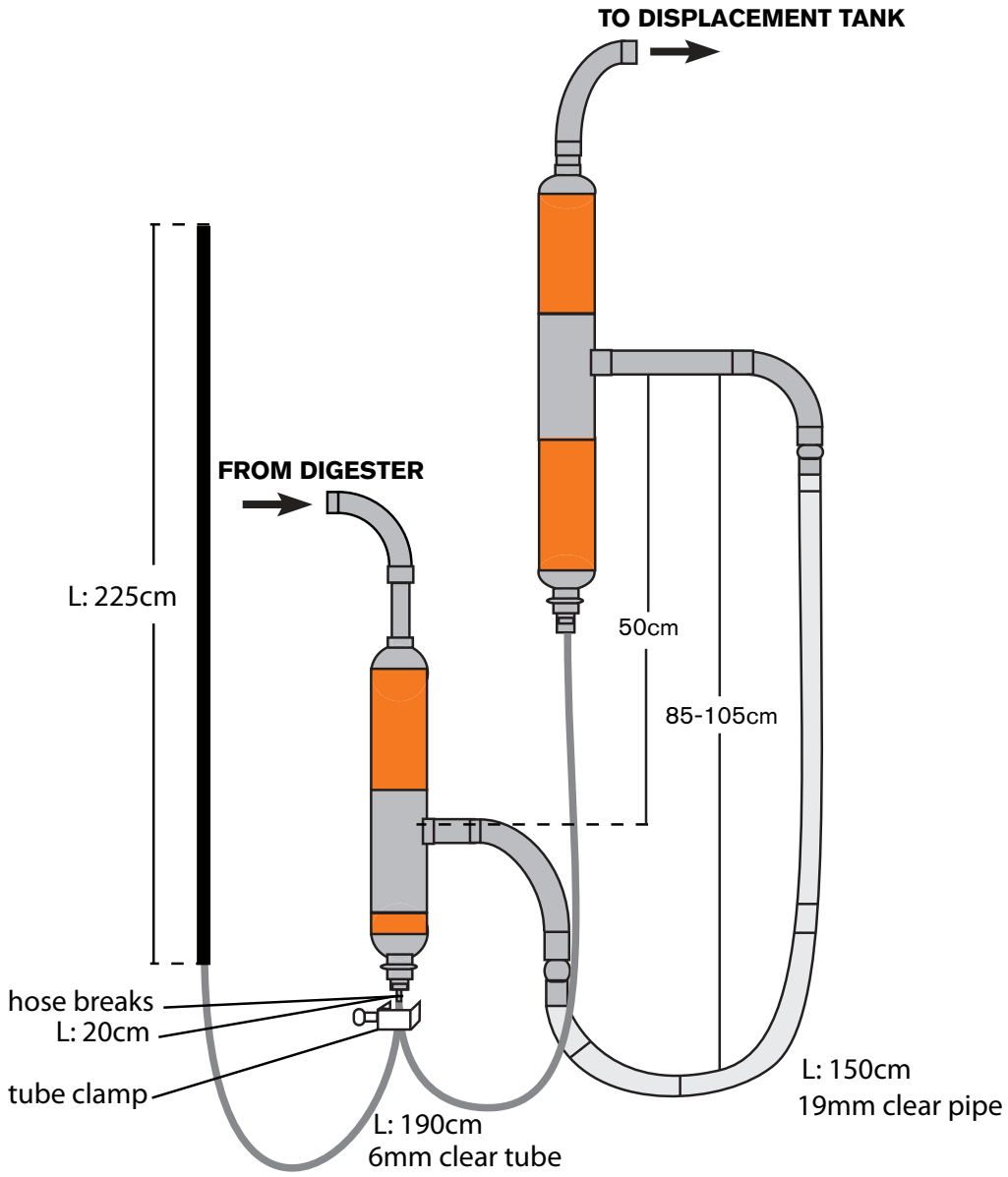
TROUBLESHOOTING/ MAINTENANCE

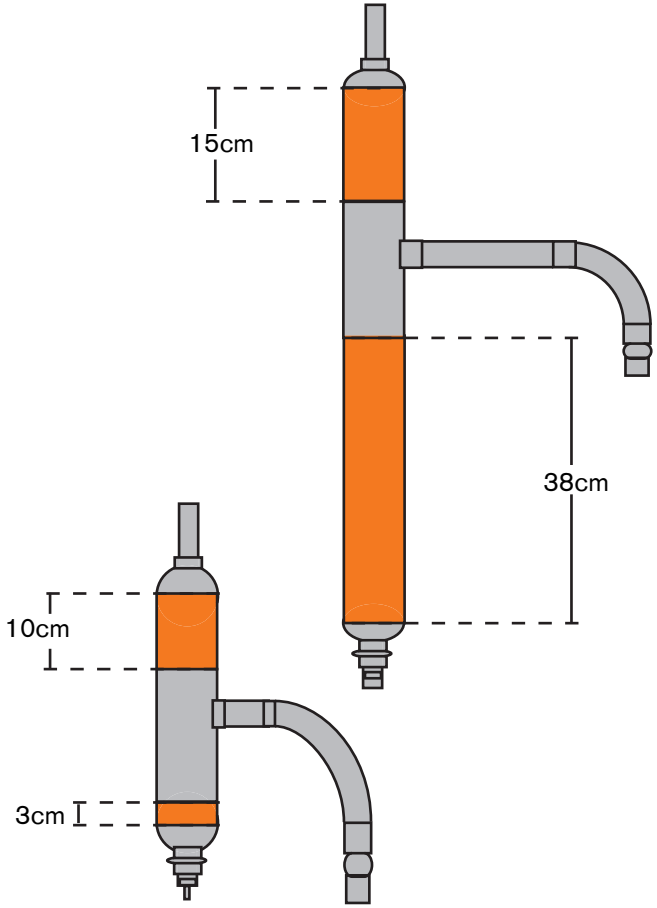


The biogas system will last for many years if you take care of the system.
A fence will protect your system against damages from cattle or other animals. If you clean your system on a regular basis, it will be preserved longer and while you are cleaning look for leaks. If the system is kept clean it is easier to find eventual errors and it will have a more prominent appearance.

WARNING never have an open fire or cigarettes near the biogas system. The biogas is explosive.
Never sniff or inhale the biogas.

MATERIALS/ HYDRAULIC VALVE





MATERIALS/ HYDRAULIC VALVE

DESCRIPTION	DIMENSIONS	ITEM PRO P/ RIAS	LENGTH/QUANTITY
Low pressure chamber upper	Ø 63 transp. Pipes	Rias 70704063018	l: 25 cm
Low pressure chamber lower	Ø 63 transp. Pipes	Rias 70704063018	l: 45 cm
High pressure chamber upper	Ø 63 transp. Pipes	Rias 70704063018	l: 18 cm
High pressure chamber lower	Ø 63 transp. Pipes	Rias 70704063018	l: 12 cm
Tube trap / standrør	Ø 25	AP3-25	l.10cm 2 pcs
Departure to trap / standrør	Reduk.tee Ø 63-25	AL2-63-25	2 pcs
Bøgning trap / standrør	Long Island bøgning 25	AL38-25	2 pcs
Reducing the taper standrør	nippelmuffe 25-20	AL28-2520	2 pcs
Hose Nozzle trap / standr.	Hosetail Ø 20	AL14-20	2 pcs
Muff approach digest	Sleeve Ø 63	AL22-63	1 pc
Reduction approach digest.	Nippelmuffe 63-32	AL28-6332	1 pc
Hose Nozzle from you.	Hosetail Ø 32	AL14-32	2 pcs
Muff departure displacement	Sleeve Ø 63	AL22-63	1 pc
Reduction departure displ.	Nippelmuffe 63-32	AL28-6332	1 pc
Hose Nozzle for disp.	Hosetail Ø 32		2 pcs
Return muff	Sleeve Ø 63	AL22-63	2 pcs
Return reduction	Nippelmuffe	AL28-6325	
Return threaded transition	Nippelmuf. / gv.nip (25x ½ “)	AL30-20-25-4	2 pcs
Return hose nozzle	slangst. ½ “indv.x 6	A1F-8	2 pcs
Distributor return / fill	y tube collector ø 6mm	A7-2	1 pc
Hose clamp			1 pc
carrier tube gray	42-65 mm	BR370-3	4 pcs
Packing in return long taper	½ “flat packs. Int Gev.	E16-23i	2 pcs
Hose ascension	19x24mm clear PVC uforst.	JA3-1924	1,5 meter
Return / filling hose	6x8mm	AJ3-0608	5 meter