

SEEBEK GENERATOR

Make Energy From Weeds

Step-by-step plans

Introduction

Solar, wind, water, geothermal and biomass are sources of producing renewable energy.

Production of energy from sun, wind, water and geothermal need costly equipment. Even the smaller scale models of solar and wind energy for a medium sized home costs more than 3000 US Dollars. Individuals can't think of energy from water and geothermal as the required infrastructure will cost the heaven. They also require regular maintenance of moving parts, batteries and other things.

Renewable energy from biomass is the cheapest form of all sources mentioned above, which require minimum initial investment and practically no maintenance at all. The biomass fuels like vegetation, crop residues, cattle waste, kitchen waste and aquatic plants are abundant in nature and also easily available throughout the year. A medium sized biomass digester can be built with about 100 US Dollars.

Here, I have the best device with producing energy from anaerobic digestion of weeds.

We had a very good rainy season this year in our area and everyone is happy. The rains also helped weeds to spread and grow at a faster phase covering open areas. road sides, home gardens and all !

There are weeds, weeds, weeds everywhere...

Few of our neighbors hired some help to weed out their patch of land. Some threw them out and few heaped them to make compost. Also, some farmers used chemical weed killers / herbicides to completely destroy all those weeds from their agricultural land. But you can, left all those weeds in your home garden to make energy from them.

This plan is aimed at the common man with simple to follow steps explaining how we can efficiently extract energy from all those unwanted weeds and use the remains as compost.

Please read on.



Step 1: How can We Extract Energy from Weeds...?

One of the easiest way to extract energy is anaerobic digestion of weeds. The definition of anaerobic digestion as quoted from the internet: "is a collection of process by which microorganisms break down biodegradable material in the absence of oxygen".

As the weeds are biodegradable material, why not try the anaerobic digestion process to break them down to extract energy?

The subsequent steps will explain how simple it is to extract energy from weeds.



Image Notes

1. Anybody can build this medium sized biogas digester with minimum resources

Step 2: Collect Weeds

The capacity of the digester in the biogas plant I have built earlier is 750 liters. Leaving about 50 liters for free board, we can consider the net capacity as 700 liters.

Considering 30 to 35 days of retention time, I can feed about 2.5 to 3.5 kilogram of weeds per day in this plant. For my device with weeds, I choose to feed about 2.5 kilograms of freshly collected weeds mixed with enough water to make it to about 20 liters of diluted feed material. The mixture will also have a retention time of about 35 days in the digester. I will also get about 20 liters of composted slurry every day, which can be diluted and applied as compost to plants in the garden.

I have tried with all type of weeds from the home garden and surrounding areas. They include weedy plants, weed creepers, leaves of trees, grass and whatever available nearby. Due to rains the ground was very soft and I could pull out most of the weeds with roots. About 4 kilograms of these freshly collected weeds will give 2.5 kilograms of feed material after trimming out the roots and removing the woody parts. Otherwise, you can just collect the weed clippings without the roots and use them as they are. You can also collect three to four days requirement in advance and keep them separately.



Image Notes

1. weeds collected from our home garden



Image Notes

1. weeds



Image Notes

1. Grass



Image Notes

1. Leaves from weed trees

Step 3: Remove Roots and Chop weeds

In the pictures above you can see that I have trimmed away unwanted roots and stems from the weeds. Then using a garden shear, I have also chopped down the weeds to manageable size.

To make an assessment of how much weeds make a kilogram, I have weighed about one kilogram of chopped up weeds in a bag. The red basket in the picture here contains about two and a half bags, that is, 2.5 kilograms of chopped weeds ready to be pulverized.

I feel it is not necessary to weigh the weeds again and again every day as the basket-full of chopped up weeds will make the daily requirement.



Image Notes

1. trim the roots of weeds



Image Notes

1. Throw away the fibrous stems



Image Notes

1. Trim away the roots from the weeds



Image Notes

1. This bucket contains 2.5 kilograms of chopped weeds
2. Keep the leftover weeds for tomorrow
3. Remove stems from the weeds



Image Notes: 1. One kilogram of chopped weeds

Step 4: Pulverize the Chopped Weeds

I have observed that feeding the chopped weeds directly into the plant did not digest the feed material fully. On closer examination of the slurry, I could find some partially digested chopped weeds drained out with the slurry. So, it is better to pulverize the weeds before feeding the plant.

Using a spare metal jar of a mixer grinder, the weeds were ground with little amount of water in small batches. I have recycled the water collected from the kitchen which was used for rinsing rice and lentils and used it for dilution. The pulverized weeds were then collected in a small bucket and transferred to another larger one near the biogas digester. I have also reused the water used for cleaning the metal jar after use, for diluting the pulverized weeds.

A word of caution here... Do not use chlorinated water. Also do not use soapy water used for cleaning the utensils. We use bore-well water at home which didn't contain chlorine or any other chemical.



Image Notes

1. Use a spare metal jar to pulverize weeds in small batches



Image Notes

1. Add water to the chopped weeds in the metal jar



Image Notes

1. we use recycled water used for cleaning rice and lentils



Image Notes

2. Pulverizing the weeds using a mixer-grinder



Image Notes

1. Pulverized weeds in the metal jar
2. Transfer the pulverized weeds into a bucket



Image Notes

1. Pulverized weeds
2. wash the metal jar after every use
3. Recycle the water used for cleaning the mixer jar



Step 5: Dilute with Water and Feed the Biogas Digester

I have used a 20 liter capacity bucket to transfer and dilute the pulverized weeds near the feeding point. More water is added up to the brim of the bucket to make to 20 liters. The diluted crushed mixture is then fed into the biogas digester through the feed pipe. This is a repetitive process and should be done every day to get uninterrupted production of gas.

There may be some soil particles collected along with the weeds. These particles may get deposited at the bottom of the diluted mixture. So, do not empty the bucket containing pulverized weeds in to the feed pipe and discard the soil deposit away.

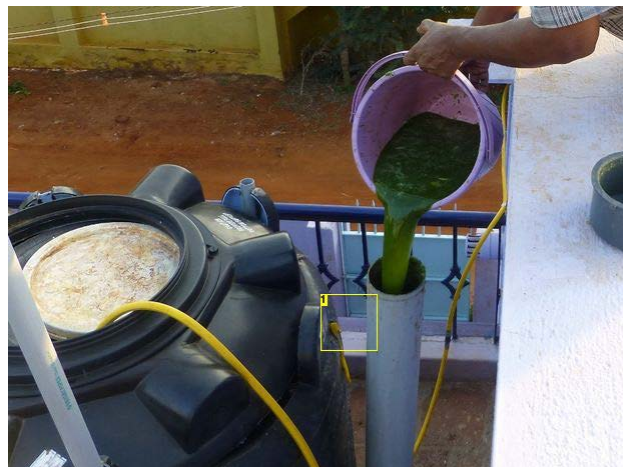


Image Notes

1. Dilute the pulverized weeds with more water
2. Pulverized weeds diluted with water to make 20 liters
3. Feeding the pulverized weeds through the feed pipe
4. Throw away the soil deposit at the bottom

Step 6: A Study on Production of Energy

In terms of cubic meters

With 2.5 kilogram of pulverized weeds, let us see how much cubic capacity of gas is produced:

Inner diameter of gas holder = 80 centimeters (0.80 meters) (Radius is 0.40 meters)

Average height raise due to gas production = 45 centimeters (0.45 meters)

Cubic content of gas produced: $3.1428 \times (0.40 \times 0.40) \times 0.45 = 0.226$ cubic meters.

The above quantity also contains impurities like Carbon Dioxide, Nitrogen and Hydrogen Sulfide.

Liquefied Petroleum Gas (LPG) versus Biogas

Another test to find out the actual efficiency of the biogas is to compare with Liquefied Petroleum Gas (LPG) normally used in our household.

In our home, a full LPG cylinder containing nearly 15 kilograms of gas normally lasts for about 30 days. So, our consumption works out to about 500 grams of LPG per day.

I have placed both the systems (one using LPG and another with Biogas) side by side. On 13 November 2015 we installed a new LPG Cylinder and started using both LPG and Biogas simultaneously. The LPG cylinder was fully emptied on 24 December 2015 and replaced with a new one.

The LPG cylinder which normally lasts for only 30 days has now been utilized for 54 days in conjunction with Biogas. At the rate of 500 grams of LPG per day, the additional 24 days \times 500 grams = 12000 grams of equivalent LPG has been supplemented by Biogas.

Production of Biogas per day from weeds equivalent to LPG = 134.15 grams

So, 0.226 cubic meter of biogas produced everyday (mixed with Carbon Dioxide, Nitrogen and Hydrogen Sulfide), gave us 134.15 grams of equivalent calorific value of energy in comparison to LPG.



Step 7: Output Slurry

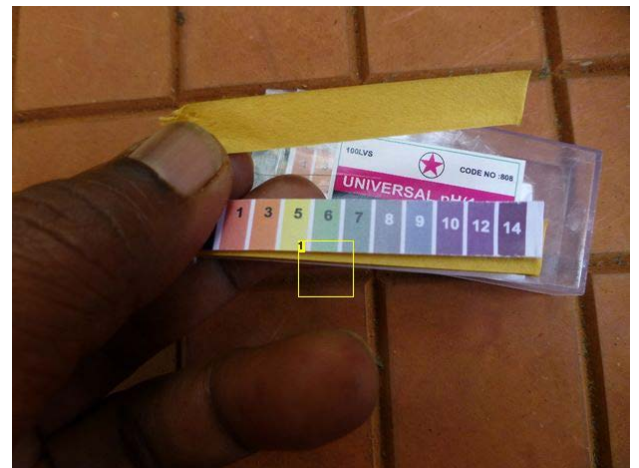
Whenever the biogas digester is fed with pulverized weeds, the equal volume of digested slurry is drained out through the outlet pipe. Here also, I have used a 20 liters bucket to collect the slurry, which can be used as compost in the garden.





Step 8: PH of Slurry

I have tested the pH of the output slurry with the help of pH test strips. The pH was measured between 7 and 8 in comparison to the Test chart provided with the kit. The slurry is slightly alkaline due to the presence of Ammonia produced by the weeds. I think this slurry is well suited as compost for our garden's red soil which is little bit acidic in nature.



Step 9: Maintenance Of the System

The anaerobic digester needs very little maintenance. However the following steps will help in uninterrupted gas production.

The anaerobic process creates heat and some water vapor also gets mixed with the biogas. This water vapor will condense and may get trapped in gas pipe. To prevent this always keep the outlet valve closed at the gas holder tank. This will help in most of the condensed water to fall back into the tank. Open the gas pipe once in a week and drain out any condensed water from the pipe line.

Secondly, the slurry in the tank needs to be agitated to prevent the formation of surface crust. I do this after every feed using a vented ram through the feed pipe.

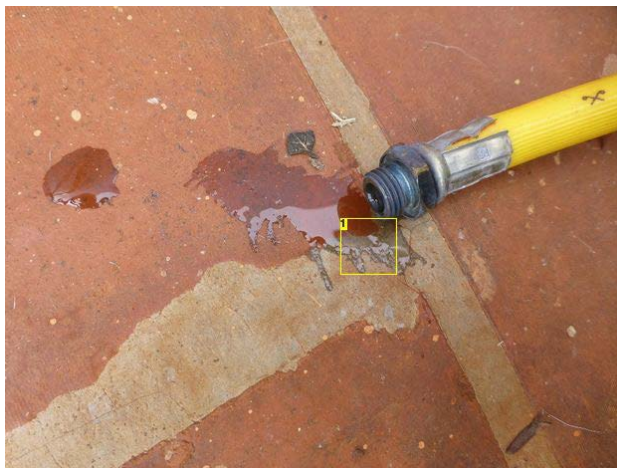




Image Notes

1. Keep the gas outlet valve from gas holder closed. This prevents water from entering in the pipe line
2. Open the pipe line here for draining
3. Drain out water from the gas line
4. Vented Ram
5. Insert the vented ram into the feed pipe after feeding
6. Up and down movement of the vented ram will agitate the slurry

Step 10: The Bottom Line

It takes less than an hour for me to collect, clean, chop, pulverize and feed the weeds in the anaerobic digester. It requires less than 5 minutes of mixture-grinder time to pulverize 2.5 kilograms of weeds in small batches, which is more than compensated by the output biogas and digested slurry as compost.

Advantages of the system

- Our home garden gets a regular weeding operation
- The weeds are utilized to extract bio-fuel
- The digested slurry is recycled as compost for the plants
- Does not involve any running costs other than few minutes of electricity for pulverizing the weeds
- It is also eco-friendly

Some Do's and Don'ts

- Feed the Biogas digester regularly
- Do not over feed. Keep the excess weeds for tomorrow
- Do not collect weeds from areas where pesticides / herbicides were used

- Do not use chlorinated water. We use bore-well water for all our needs.
- Recycle water wherever possible.
- Do not use soapy water used for cleaning kitchen utensils.

Create your faster and easy to build biomass digester

The components of the bio-gas plant are a digester tank, an inlet for feeding the kitchen waste, gas holder tank, an outlet for the digested slurry and the gas delivery system for taking out and utilizing the produced gas.

It burns for approx. 20-30 min.to build it, you can add anything from your kitchen waste (Except Onion peels and eggshells). In 12 hours the Gas is ready for use. It is very easy and cost effective to build (only 2-3 dollars) and gives many useful products.

The main components of this system are:

- 1) Inlet pipe
- 2) digester tank
- 3) gas holder tank
- 4) slurry outlet pipe
- 5) gas outlet pipe



Image Notes

1. Inlet
2. Inlet
3. digester tank
4. outlet tank
5. outlet tank
6. Gas holder
7. Gas holder

Image Notes

1. Digester Tank
2. Gas Holder Tank
3. Inlet for feeding kitchen waste
4. Outlet for digested slurry
5. Gas Delivery System
6. Guide pipe for moving the Gas holder tank up and down. Need to reduce the height to match up with the Digestion Tank



Step 1: Chose the correct container

You will have to choose a correct size container which will act as a digester tank.
My one is liters tank. I got it from scrap.



Image Notes

1. Digester tank
2. Digester tank

Step 2: Make holes

Make holes in the tank for Inlet and outlet. For this I took an old iron rod and heated it to make holes. CAUTION: rod is really very hot.

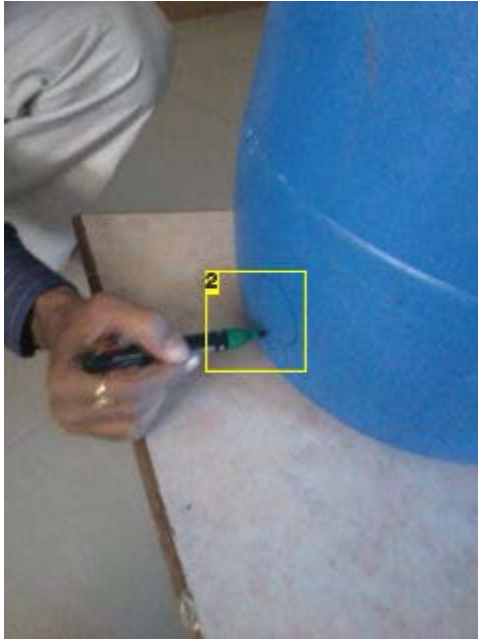


Image Notes

1. Markings
2. Markings



Image Notes

1. heating the rod



Image Notes

1. Drilled holes!

Step 3: Fix the inlet and outlet pipes

Glue the Inlet pipe and the Outlet pipe with any water proof adhesive.

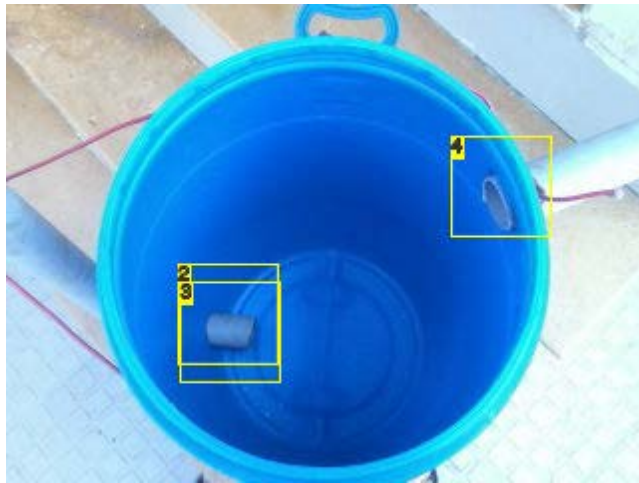


Image Notes

1. Inlet Pipe glued
2. Inlet Pipe glued
3. Inlet Pipe glued
4. Outlet pipe



Image Notes

1. Digester Tank Ready.
2. Digester Tank Ready.

Step 4: Making the Gas holder Tank

I took a paint bucket of 20 lts for making a gas holder tank. This tank holds the gas produced. The tank is overturned and fixed with a valve used for plumbing purposes.



Image Notes

1. Valve
2. Valve
3. Pipe connector
4. Pipe connector

Image Notes

1. Ball Valve
2. 'T' Joint
3. Barb and clip crimped with the gas pipe
4. Flexible gas pipe
5. Adaptor
6. Nipple
7. Cap



Step 5: Time to mix the weeds!

Mix the cow dung in proportion of 50/50. add 50% water and make a fine slurry. Now put the slurry in the digester tank.



Step 6: Almost finished!

Put the gas holder tank overturned in the digester tank after adding the slurry . REMEMBER: open the valve while putting the gas holder tank. The mini plant takes 10-15 days for the first time to get output. For the first time, the gas in the tank want burn as it contains Carbon Dioxide gas, if fortunately it burns then good or wait for the second time. You can detect how much gas is there in this system, the gas holder tank will rises up as the gas is produced.

Wait for a day before feeding the system, allowing all joints to get cured and become leak-proof.

Initially, the mixed with water will be fed in to the system, which will start the gas formation process.

The gas holder will rise along the guide pipes based on the amount of gas produced. We can add some weight on top of the gas holder to increase the gas pressure.

First production of gas will consist of oxygen, methane, carbon di oxide and some other gases and will be released to the atmosphere.

Subsequent gas will consist of about 70 to 80 percent methane and the rest carbon di oxide, which can be used to create energy.



Modify your old Generator to Biogas

Generators are a wonderful convenience when the power is out - unless you have no gasoline. Then they are a huge paperweight and an annoying reminder you should have had more gas on hand. This conversion is very fast and allows you to run your generator on gasoline, propane or biogas - and easily switch between the three.



Step 1: The Essentials

There are two essential pieces to a conversion:

1. On Demand Regulator AKA Zero Governo

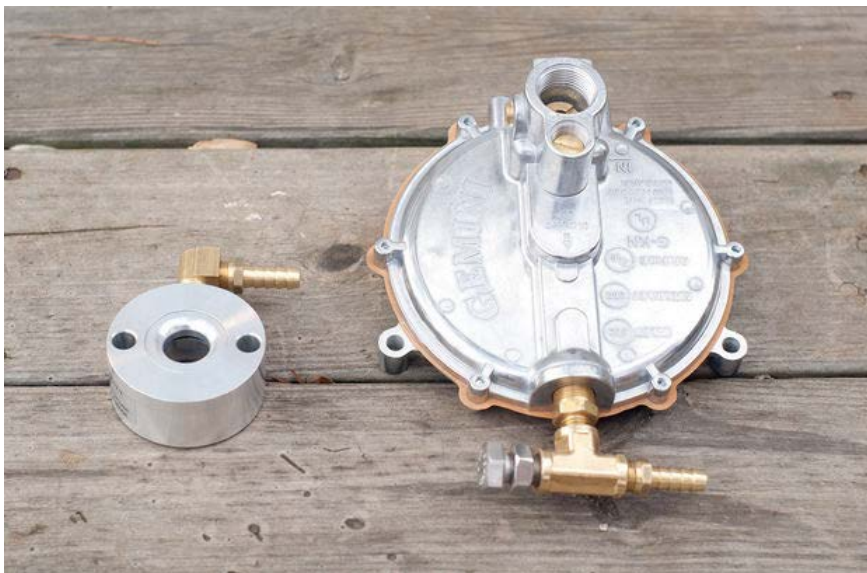
2. Carburetor

Adapter

I've seen a lot of very bad unsafe conversions - mainly ones that skip the on demand regulator. This device is crucial to safety. There is a vacuum valve inside the body that only allows fuel to flow when there is suction on the outlet. As your engine spins it creates a vacuum that draws in the air and fuel. This vacuum demand opens the valve on the regulator and allows fuel to pass. If for some reason your engine turns off the flow of fuel would immediately stop. While it is possible to just stick a propane line in a carburetor and spin it over - it is a very bad idea.

The carburetor adapter is device that is placed between the carburetor and the air cleaner. It allows for the injection of the propane or biogas in to the fresh air coming from the air filter and into the carburetor.

I wanted a tri-fuel adapter and not a conversion kit. I want the flexibility of being able to run on three different fuel types.



Step 2: The Kit

I've seen several kits for sale. I think I got a very good deal from US Carburation. They are switching their adapter style and they sold me this kit for \$78 shipped from their eBay store. This being my first conversion I wanted a commercial product. I'll probably play around with my own adapters on other engines.

Included in the majority of the kits are:

- On demand regulator
- Carburetor adapter
- Carburetor gasket
- Stud extensions
- Mounting bolts
- Teflon tape or thread sealer
- Hose used between on demand regulator and adapter
- Fittings used between on demand regulator and adapter



Image Notes

1. propane extension hose
2. Adapter
3. Adapter
4. Stud Extensions and Gasket
5. Load Block (gas flow regulator)
6. In from propane/natural gas source - need adapter fitting
7. From zero governor
8. Zero Governor/on demand regulator
9. Mounting bolts, clamps
10. Mounting hole

Step 3: Not Included

This was a very inclusive kit - but there are a few pieces that are not included.

- Low pressure regulator \$9.99
- Threaded tank fitting - gifted from dad's pile of I'll never use it again.
- Hose between the low pressure regulator and the on demand regulator - gifted from dad again.
- Fitting between hose and on demand regulator \$2.69
- Cap for when no propane hose is attached \$1.09

Additionally I added a 1/4 inch ball valve between the carburetor adapter and the on demand regulator. I did not want to be pulling a vacuum on the diaphragm when it was being used with gasoline. (\$7 big box store).

Check a local camper supply store for the fittings, regulator and hoses you will need. They will be more knowledgeable and easier to deal with than a box store. Mine was also cheaper with a much larger selection.



Image Notes

1. Low Pressure Regulator
2. Propane tank fitting
3. Gas hose from Dad's pile-o-spares
4. 1/4 inch ball valve -optional
5. bushing ball vale to regulator
6. Zero governer to fule line fitting

Step 4: Remove Air Filter

Remove the air filter cover and air filter.



Step 5: Remove Filter Housing

Remove the nuts securing the air filter housing to the carburetor.

Carefully remove any choke levers and breather tubes.

Don't louse the gasket - you will need to reuse it.



Image Notes

1. remove choke lever
2. Don't loose this gasket.
3. possibly extend breather hose

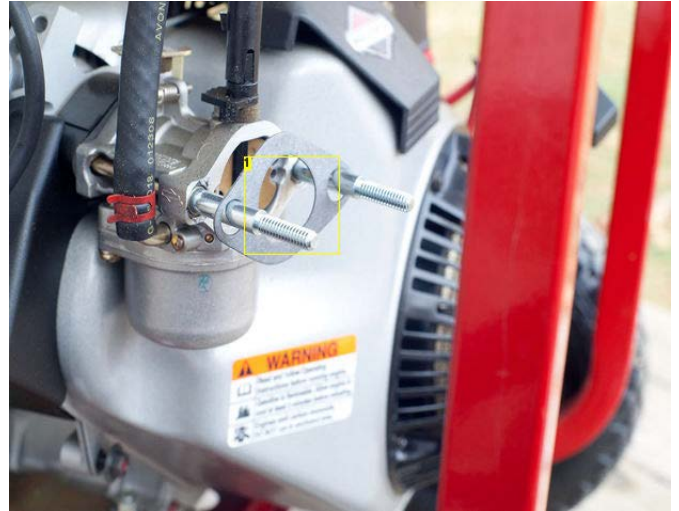
Step 6: Install Stud Extenders and Gasket

Screw on the stud extenders. Use a pair of pliers to snug them up by gripping the smooth area between the threads and the carb. Install the gasket included in your kit.



Image Notes

1. Screw on stud and tighten here with pliers.



1. Gasket goes on the carb side of the adapter

Step 7: Install Fuel Adapter and Air Cleaner Housing

Note the airflow orientation of the carburetor adapter. Dry fit the elbow and find the direction it should be pointing.

Remove elbow and cover threads in teflon tape or thread sealer.

****Ensure teflon tape does not extend past the last thread and get into the flow of the gas.****

Slide the carburetor adapter over the stud extensions. Reinstall the air cleaner housing ensuring the gasket is between the housing and the carburetor adapter.

Install air cleaner and cover.

Clamp the fuel hose on the elbow. Reattach choke lever if it was removed.



Image Notes

1. Notice directional air flow



Image Notes

1. reinstall housing and nuts
2. I can still use the choke!

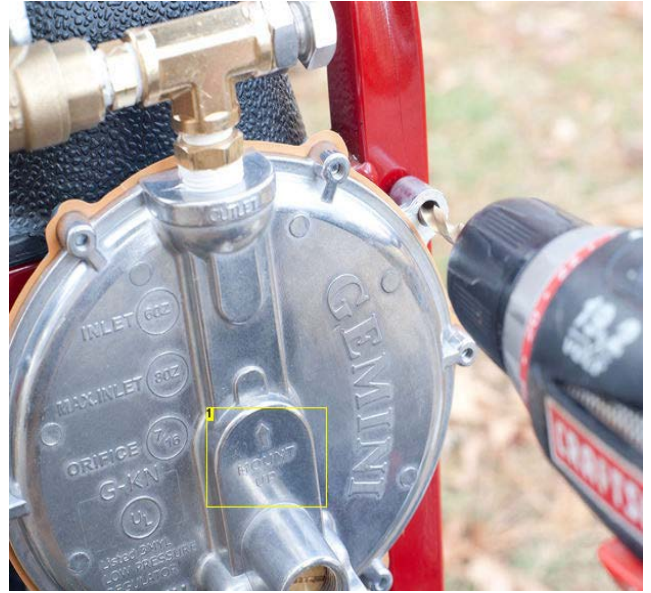
Step 8: Install Zero Governer

Install all fittings with teflon tape or thread sealer before attaching to the frame.

Hold the on demand regulator up to the frame and find two points of contact.

Mark, drill and bolt using the supplied bolts.

Please be careful - don't drill into the gas tank!



Step 9: Start and Load Set

Start the generator and get it to operating temperature on gasoline.

Turn the fuel valve petcock to the off position - and let the engine run all the fuel out of the carburetor and biogas line.

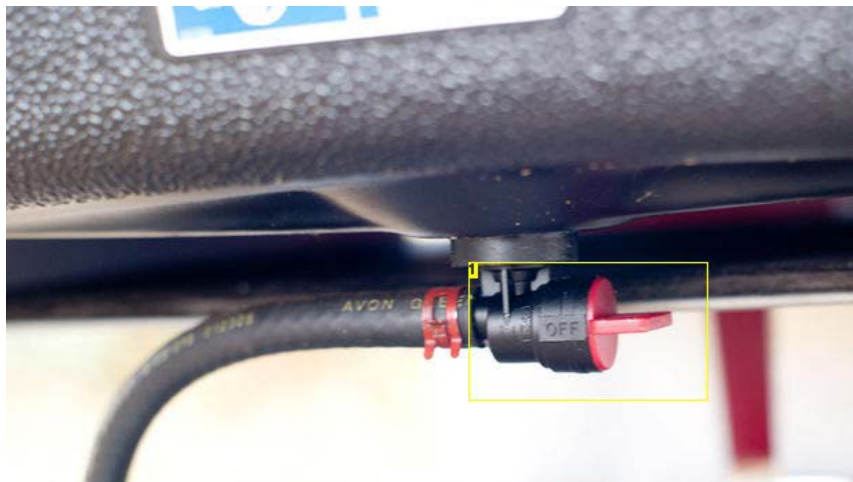
Turn your set screw in all the way. As per my manual I had to turn it out five full turns.

Turn on the propane at the biogas tank.

Press the prime button on the back of the on demand regulator for 1 second.

Start engine - adjust screw in for less fuel and out for more. Once you find the right mixture use the set not to lock it in place.

Image Notes
1. Gasoline off.





Easy to Home Hook Up your Generator

A generator is a core component to many people's emergency preparedness plans. (Maybe you have a cool charcoal powered or a multi-fuel generator.) However many fail to think through how exactly they will power the items they want to run when the grid is down.

The breaker interlock system has come in very handy for us. We can turn on overhead lights, wash clothes and keep our food cold, charge our phones, run the internet and much more....all while keeping our doors and windows closed and not tripping on extension cords!

Disclaimer:

I am not an electrician. After much consulting and oversight from a licensed 25 year Master Electrician I believe these instructions to be correct and accurate for my jurisdiction. Electrical codes vary from place to place. In my place of residence home owners are allowed to do their own electrical work if it is up to code. You are responsible for any code violations, permits or awesome good stuff that comes from doing a project like this.

Please be careful and contact an electrician!

Step 1: NEVER DO THIS

I've listened to and have even seen people using a double male plug to energize their house during a power outage. This is dangerous.

- It is an electrical code violation.
- It is illegal in most places.
- The power created by your generator is generally greater than the rating for the receptacle, wire and breaker.
- If you don't disconnect your main breaker it can shock the power company linemen - and you will get sued.
- You can easily get shocked because the male plug prongs are exposed.



Step 2: Determine your generator plug type and amperage

First you have to figure out what type of amperage and plug type we are working with. You only want to do this on a generator with a big round plug. This will provide 220V (in the US) and power both sides of your breaker box. You will see the amperage written near the plug. Mine is a 30 Amp L-14-30.

For your convenience these are the most common sizes:

Nema L14-20 - 20 amp

Nema L14-30 - 30 amp

Nema CS6365 - 50 amp



Image Notes

1. Voltage and Amps
2. Nema L14-30 plug type

Step 3: Supplies

Gather your supplies.

For the sake of this build we are going to assume you have a 30 amp plug on your generator - like the one shown. If you have one different please adjust your supplies.

Breaker interlock kit: Buy a UL rated device that fits your specific breaker box. These have been tested and validated to work. Many insurance companies and jurisdictions require the UL rating.

30 Amp 2 pole (double) breaker: Again you will need to buy one that fits your breaker box. All breakers are not the same.

Wire: I bought 10 feet of 10 gauge wire in black, red, green and white.

30 Amp power Inlet box.

Schedule 40 electrical conduit and fittings

Conduit body

Conduit glue

Flexible Non-Metallic Conduit and fittings (optional)

30 Amp generator extension cord. (Search Amazon for (your plug type) extension cord.)

Notice how all the amperage match. If you are using a 50 output on your generator you will need a 50 amp breaker, 50 amp power inlet box, a 50 amp extension cable and 8 gauge wire.



Image Notes

1. 30 Amp Power Inlet Box
2. 30 Amp 2 pole breaker
3. 10 Gauge wire. Load or "Hots"
4. 10 Gauge wire. Common and Ground



Image Notes

1. 90 degree conduit body with rubber gasket
2. Conduit glue
3. Schedule 40 electrical conduit
4. Conduit fittings



1. 15 Foot Nema L14-30 10 guage extension cord.

Step 4: Drill (or find) access hole

Measure 5 times drill once.

My house had a conduit old hole in the foundation. Most people will need to drill one. A hammer drill is extremely helpful for making one. Try to get the conduit hole as close to the panel as you can.



Step 5: Mount power inlet box

Remove the front cover from the power inlet box.

Remove a knock out and attach the PVC fitting. You can see here I opted for the water tight connector. Glue works just fine too.

Using tapcons mount the power inlet box to the wall.



Step 6: Test fit and glue conduit

Use a hack saw and cut the conduit to length.

Don't glue it until you know it fits. Once you are good glue it down.



Step 7: Wire the generator inlet plug

Once the glue is dry we can start to work on the wiring.

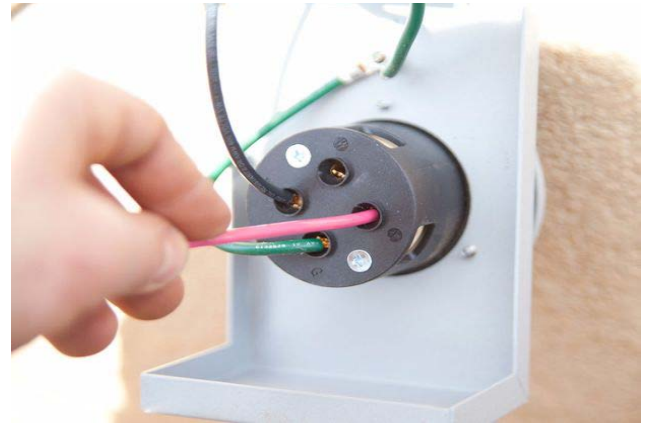
Remove the cover on the conduit body. Pull the wires through one at a time attaching them to the plug as you go along. Remove about 3/4 of an inch of the insulation.

Use a large flat screwdriver or a nut driver to tighten the terminals.

Green - Ground to the power inlet box.

White - Common, W terminal

Black and Red - Load - either X or Y terminal.



Step 8: Push wiring inside

Push the wires through the conduit into the house one at a time.

Replace the conduit body cover, checking proper fit of the gasket.

Fill any gaps between your conduit and the house with silicone or expanding foam.



Image Notes

1. Foam or silicone any gaps.

Step 9: Prep breaker box for wires

Turn off all the branch breakers and the main power breaker.

Remove the front panel of the breaker box by taking out the four screws.

Remove one knockout and screw in conduit adapter or in my case a blue nonmetallic conduit adapter.

Pull wires through conduit and into the box.



Step 10: Create open breaker space

The breaker interlock method requires the two most upper and right breaker space to be free.

Generally you will need to move a breaker or two down. Most boxes will have enough spare wire to move things around a bit. If you do not have enough room and your breaker is 30 amps or less you can use a short piece of insulated wire and a wire nut.

DO NOT wire nut copper and aluminum wire together. They will corrode over time. You will need to pick up a wire splice at your local home store.

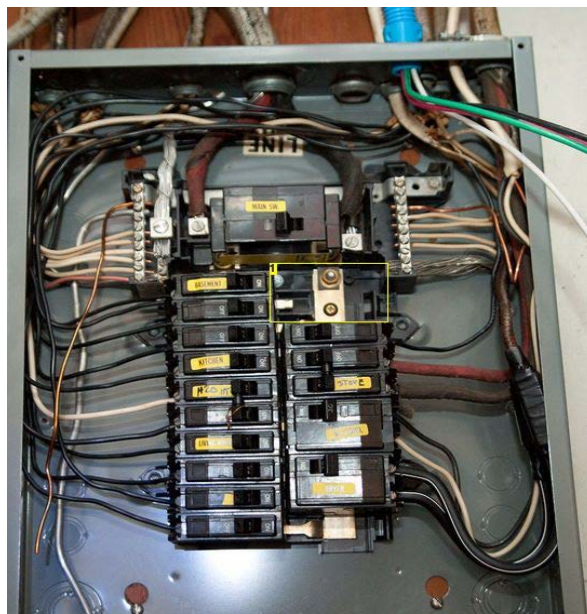


Image Notes

1. These two spaces need to be open.

Step 11: Install generator breaker and wires

Install your new breaker in the freed up space in the upper right of your breaker box.

The red wire goes to one terminal on the breaker and the black goes to the other.

The white wire goes to the common bond rail in the box.

The green wire goes to the ground rail.

Note: In a 2 wire home like mine - meaning no 3rd ground wire in the outlet box or the outlets in the home. It is acceptable in my jurisdiction to put the green ground wire to an open common terminal. It is not appropriate to use the ground wire for the common at the outlet.

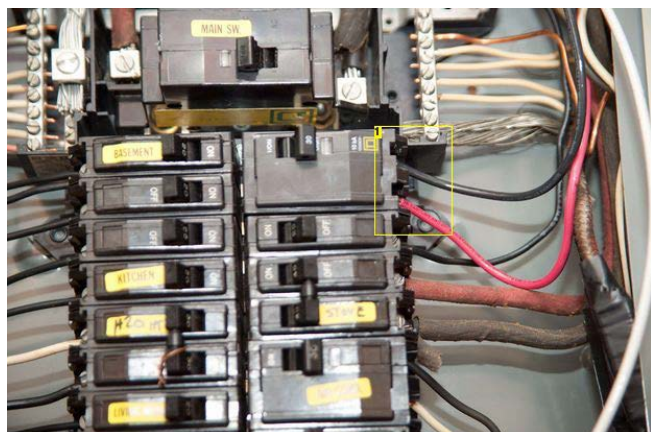
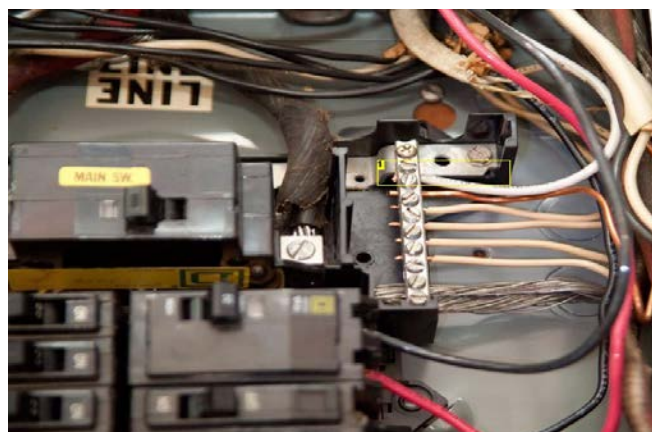


Image Notes

1. From the X and Y terminals of the generator inlet plug.



1. Common/White

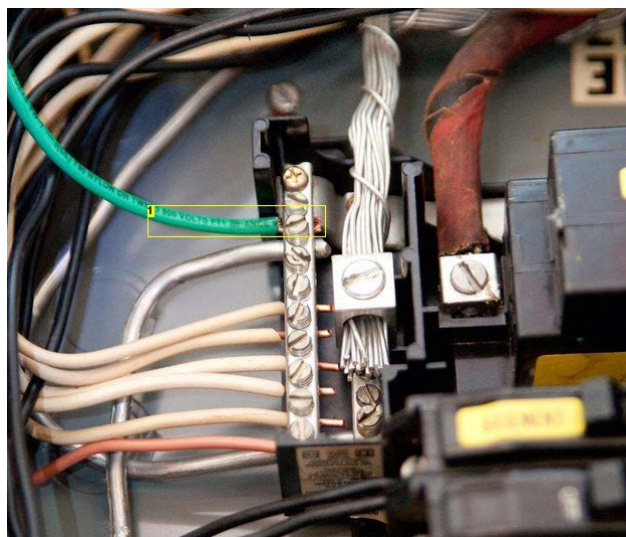


Image Notes

1. Ground wire to GROUND BAR - unless you have a 2 wire box like this. Then it goes to common.

Step 12: Install breaker retainer

Now it is time to lock down that breaker from moving. Install the retaining bracket. My retaining bolt was located between the main breakers and the 30 amp breaker.

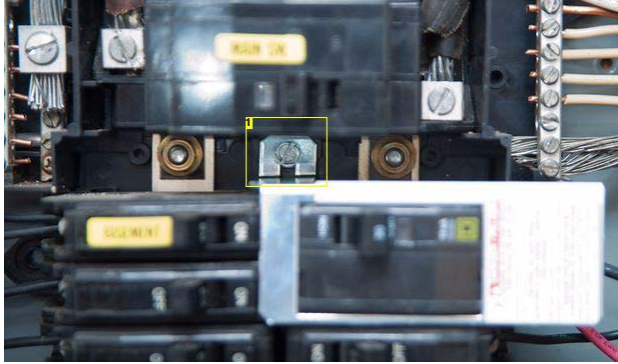


Image Notes

1. Breaker retainer anchor bolt

Step 13: Install inter lock on panel cover

Flip the cover over and use the provided template.

Pre-drill the holes and then finish them out with the bit size noted in your instructions.

Turn the panel back over and install the sliding interlock bolts.

Reinstall the panel with all the breakers in the off position. With the main in the off position turn the generator breaker to the on position. Ensure the interlock allows for the on position. You may have to shift the position of the panel cover.

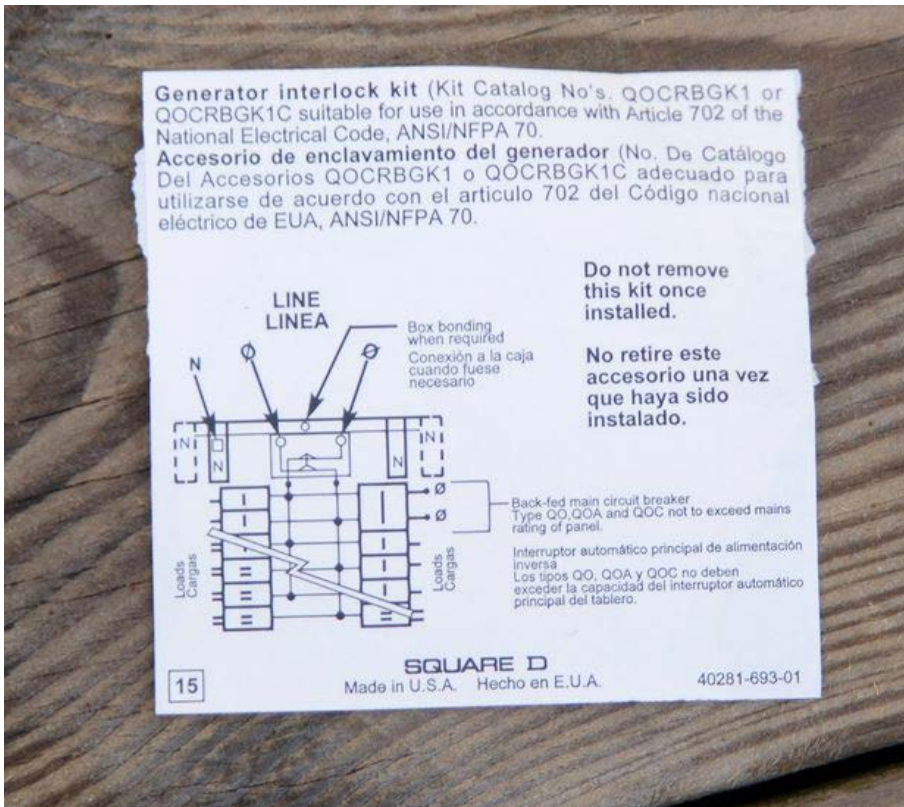
Turn the generator breaker to the off position and drop the slide so it can't be turned on. Ensure the Main can be turned to the on position. Adjust panel cover if it will not.

If it does turn the breakers on one at a time - with a 5 second delay between breakers. This will distribute the start up load.

Attach decals included in your kit to your breaker box and the outside service box.



Image Notes
1. Drill template



Step 14: Operation

Time to load test! Write down these instructions and put them in your breaker box.

1. Confirm power outage
2. Place generator 15 feet from your home - with the exhaust pointing away from open windows and doors
3. Start generator and ensure normal operating speed

4. Attach generator extension cord to the generator with an inward push and gentle clockwise turn
5. Attach extension cord to the home power inlet box with an inward push and a gentle clockwise turn
6. At the breaker box turn off all the breakers
7. Turn the main breaker off
8. slide interlock up exposing the on position of the generator breaker - turn generator breaker on
9. Turn on selected breakers with a 5 second delay in between each - ensuring the generator takes the load.

Avoid turning on HVAC, standard hot water heater and the stove unless your generator can handle it. As long as you can get past the initial startup load you can run a lot off of 30 amps.

Power off sequence:

1. Turn off all branch breakers
2. Turn off generator breaker
3. Slide down generator interlock exposing the on position of the main breaker - turn main breaker on
4. Turn on branch breakers one at a time with a 5 second delay between each one until they are all back on
5. Power off generator and allow to cool
6. Remove generator extension cord.

Enjoy your set up. It has come in very handy for us.



