

# FREE ELECTRICITY



## Chapter I. List of tools and components

Thank you all for trusting our project. We invite you to go ahead and watch the step-by-step guide for building the generator.

The main principle of this device is very simple: we are going to use organic matters (leaves, straws, urine etc. anything that can be considered biodegradable). Through decomposing, all these materials release heat/pressure, which can be used to supply an alternator. As a result, this will generate energy.

This is what you will need:

- a drill
- plastic bridles
- insulating tape
- insulating tape for electrical connections
- loctite
- tape measure
- calipers
- flat pliers
- pencil
- cutter
- wire stripper
- wrenches

- coach wrench
- screwdrivers
- allen keys

These are the tools that you will need to build the device.

We are now going to list the components needed to go on with your project:

- 2 gaskets for isolating the connections
- 2 nozzles (to attach the insert hose)
- 1 rubber gasket for the recipient's lid
- 1 lid for the recipient
- 4 wheels as the generator will be portable
- 1 OSB/plywood board – 3,4 feet long and 1,7 feet wide
- a pressure sensor (there are 2 types that you can choose, but we will explain

later on)

- about 30 washer
- 4 #6 bolts – 1 inches long
- 8 #6 bolts - 1,5 inches long
- 4 #6 bolts – 2 inches long
- 4 #6 bolts – 2,5 inches long
- 1 coupling with an allen key clamping system
- 6 #8 bolts – 1 inch long to attach the lid
- different types of electrical connectors
- male-female electrical connectors
- 34 nuts for the #6 bolts
- 6 feet insert hose
- 20 feet electrical cable

- wall mounted socket
- Air pump – you can see the details on the stamp. It has been acquired from a junk department store but it is still functional
- 40 gallons metallic container (i.e. house water supply plant container), pressure resistant
- an alternator

In the next chapter we will show you the step-by-step instructions to building the generator.

## Chapter II. Assembling the device

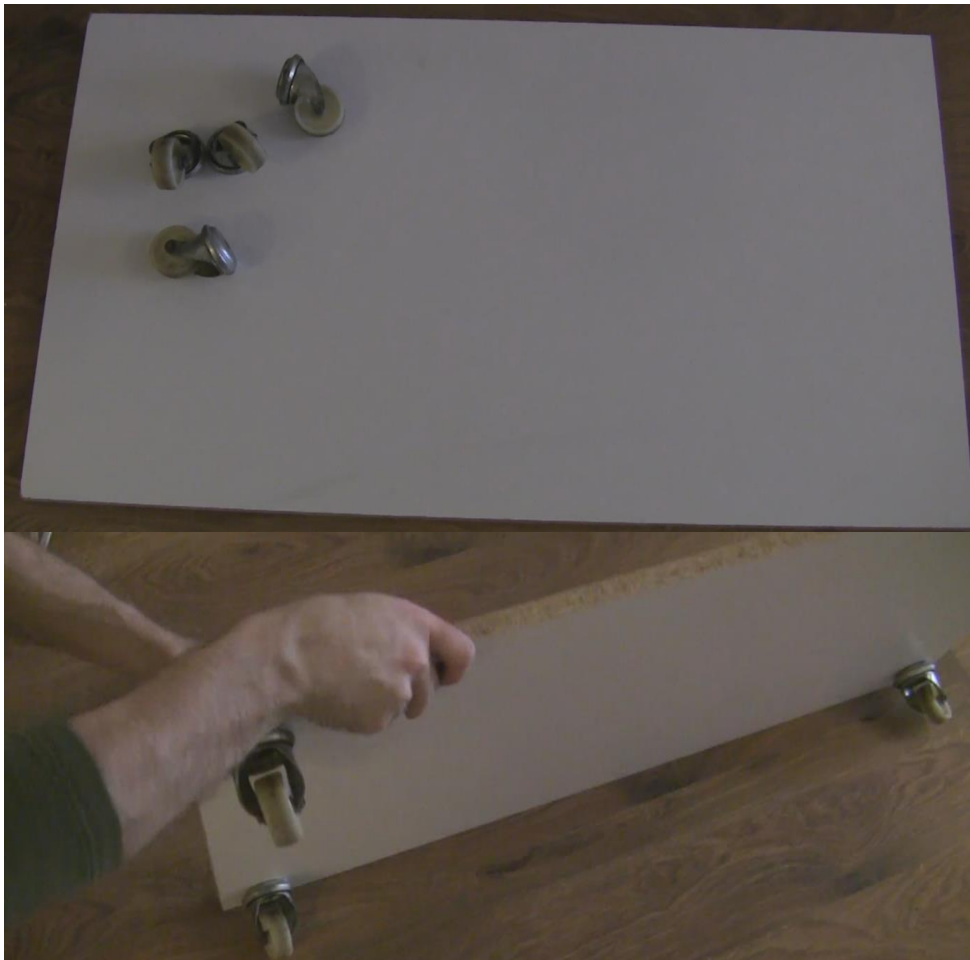
The first thing we have to do is set the holder for the generator. For this we will use an OSB board to which we will attach the 4 small wheels to make sure that the device will be portable considering the final weight of the entire device.

In order to do this we will mark the areas where we will attach the 4 wheels making sure that we leave about 3 inches distance from the edges of the OSB board and only then will we drill the holes for the wheels.

After drilling the holes we will attach the wheels. For this we will need the 4 bolts – 1 inch long. Use washers to better assemble the wheels.

Use the same procedure for each wheel.

This is how the holder has to look at the end of this operation.



The next step is fitting the metallic container on the holder.

The metallic container we have used in this project has 40 gallons but you can use larger recipients if you want to.



The container has been acquired from a hardware store. It has a hand hole, about 5 inches diameter on the outside and 4 inches diameter in the inside, 6 holes needed to place the lid and 4 mounting feet.

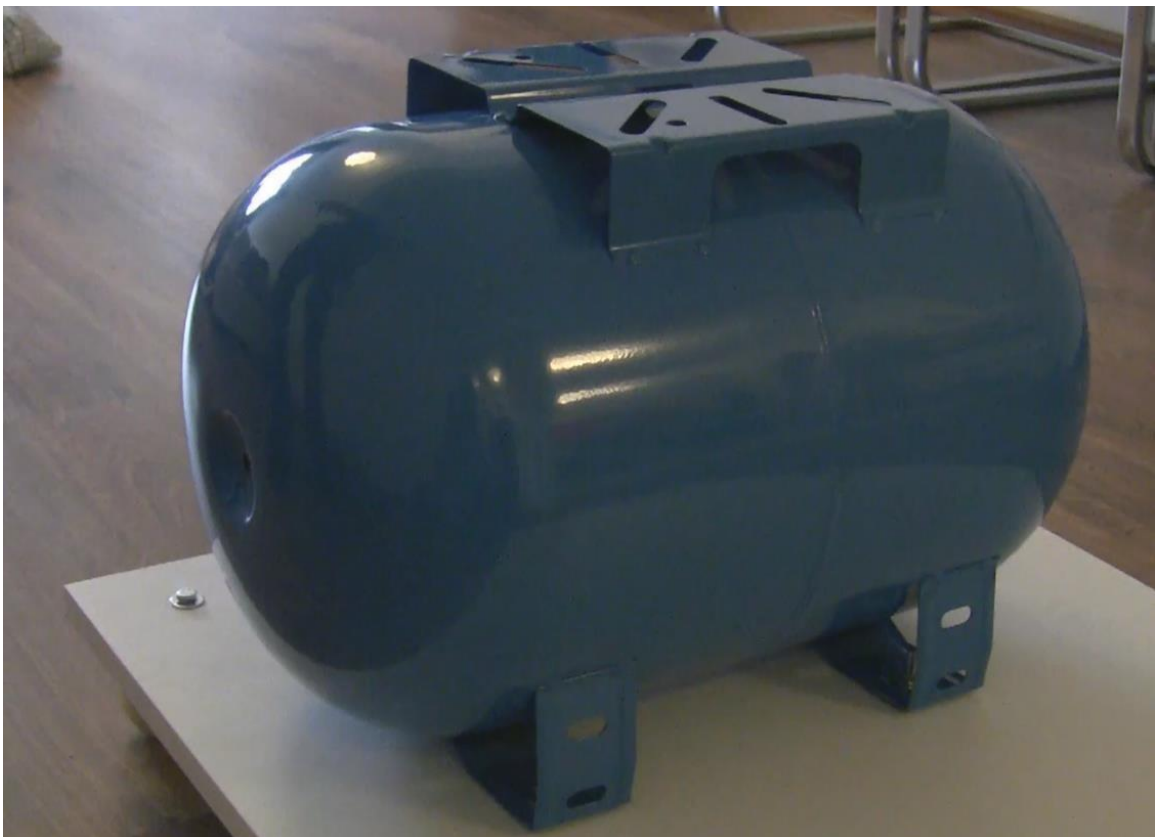


We will place the container on the holder so that one of the ends (where we will place the pressure sensor) will reach the edge of the holder and the other end we will leave a larger space where we will connect the pipes to the air pump. We will also leave about 3 inches distance from the edge of the holder.

We first mark the place where the container will be placed then drill the holes.

For this we need the 4 bolts – 1,5 inches long – and the nuts. Fasten the bolts only after placing all of them in the right place.

This is how the container for the organic matter is supposed to look like after it has been placed on the holder.



The next step is placing the pressure sensor on the decomposing container.

Here are the 2 types of pressure sensors (and older version and a new version) that can be bought from the online stores. According to the model you choose to use, the opening of the container must fit the diameter of the pressure sensor. You can use between 2 and 8 bars and should also have a pressurization gasket.



This sensor will actually cut the power supply for the air pump anytime the pressure inside the container will reach the proper pressure. It's best to fasten the sensor very well to make sure the recipient is pressurized.

Next we will place the lid at the other end of the container.





Before placing the lid, we will first attach the 2 nozzles on the lid. For this we will need loctite (you can also use hemp) and the gaskets for insulating the connections.

It's the same as working on a gas plant, which is why we have to proper fasten the nozzles.

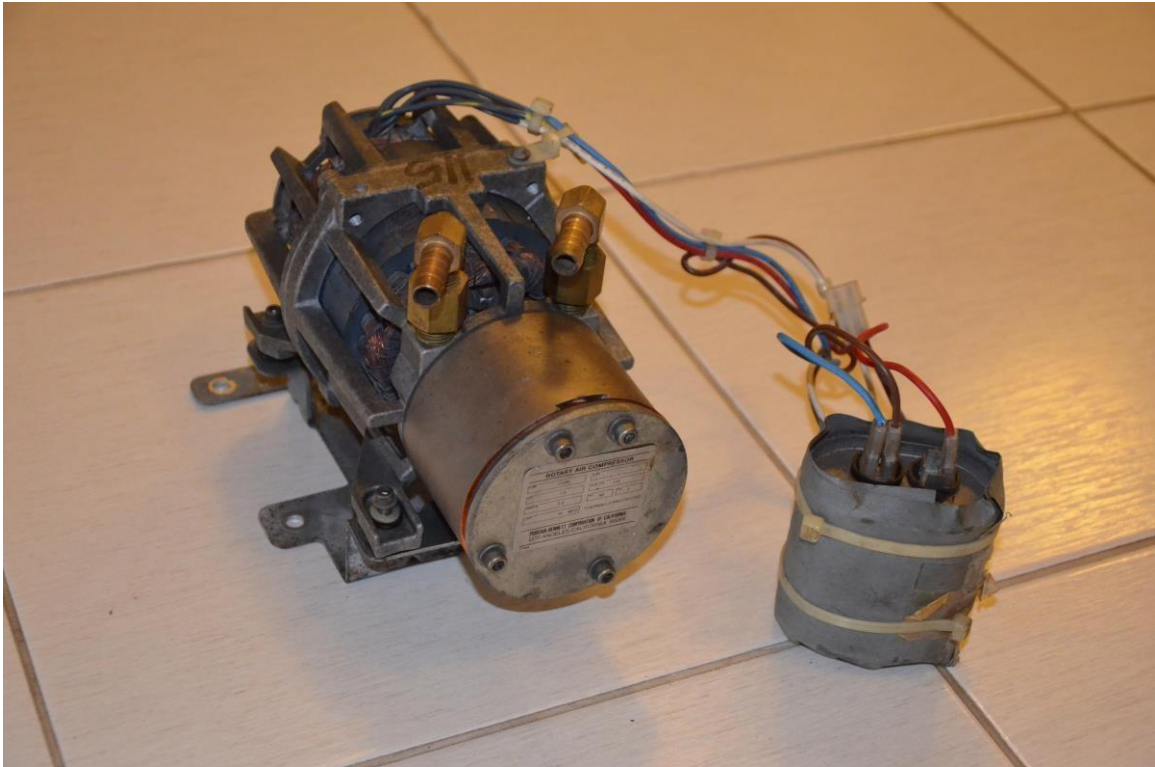
After assembling the nozzles using the rubber gasket, we will fasten it at the end of the container.



We wont fasten all the 6 bolts at this time, as we will also have to fill the container with organic matter.

If using a bigger container with a larger hand hole than the one we have will definitely ease your work. The lid of the hand hole must be able to withstand up to 2-8 bar of pressure.

The next step is assembling the air pump on the board.



The air pump has 2 ways for the air circuit, a supply cable and a capacitor for turning on the circuit on its own. The air pump can be taken from any air compression system, medical devices, air conditioner systems etc.

We will place the air pump 10 inches apart from the container. We mark the holes and then drill. In order to assemble it on the board we will need the 1,5 inches bolts, washers and the nuts.

After that we stiffen the whole assembly. We also fasten the capacitor with a plastic bridle.

After assembling the air pump, we have to connect the container to the air pump using the insert hose. We only need 2,5 – 5 bar in the container, which allows us to use it. For higher pressures we will need other types of connectors resistant to high pressure.

The length of the insert hose must be chosen according to the distance between the container and the air pump making sure that there is enough space to avoid constrictions or long lay-outs that might reduce the efficiency of the air pump.

This is how the assembly should look like after connecting the container to the air pump.

Next we'll have to assemble the alternator.



We will use an alternator that matches the type of the air pump.



The connection between the two can be either direct (like the one we are doing) or a pulleys and belts system (here you have below another model that can be fit to this project if you have that type of connection on the air pump) :

You can see that at this moment the axle of the alternator is not aligned to the one of the air pump, which is why we will use the 2,5 inches bolts to align them.

In case you will be doing a pulleys and belts system, the alternator and the pump will be placed parallel.

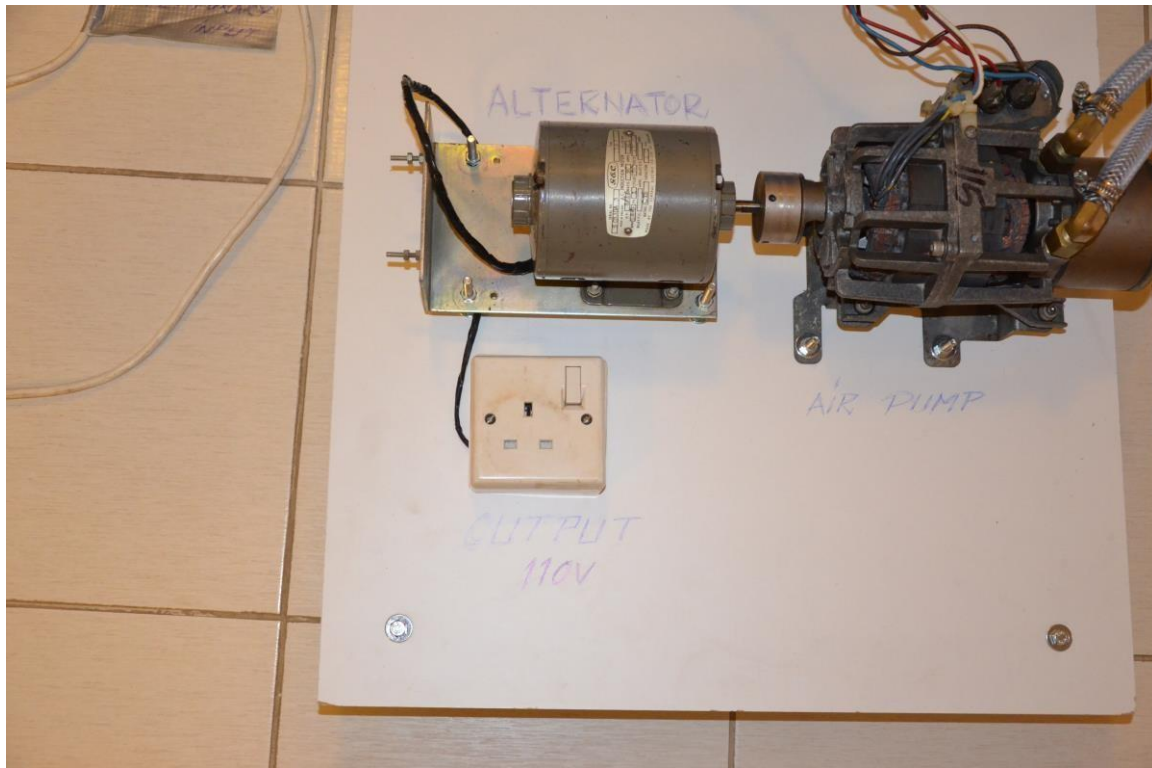
Mark the 4 points where you will place the 4 legs of the alternator.

We will first assemble the 4 - 2,5 inches bolts also using the washers and nuts.

After fastening the bolts we'll use the 4 nuts with washers on top in order to make sure that the alternator is aligned with the air pump. At first we adjust the height of the assembly by eyeballing it. All the adjustments will be made with the calipers. Make sure the alternator doesn't work loose and that the axle is aligned to the air pump. Only then will we connect the alternator using allen keys. According to the type of connection used make sure you use the proper tools to do it. Then we will assemble the gasket on the air pump axle to engage the alternator.

After all these adjustments we can fasten the alternator on the board.

Here is how the final assembly should look like:



At this time we will be assembling the wall-mounted socket on the board. This will practically be the power supply of the generator.

We use wood screws to fasten the wall-mounted socket on the board. No drilling needed. We will now connect all the cables from the wall-mounted socket to the alternator.

The next step is that of connecting the pressure sensor to the air pump. We will use male-female connectors. The pressure sensor can cut off the power supply of the air pump at a certain pressure.

At one end of the power supply cable we will attach a plug. Beware when stripping the wires! Make sure you properly insulate the cables to avoid short-circuits.

We won't be using ground wire.

This is the generator in its final stages:





We are almost done; all we got left to do is filling the container with organic matter.

## Chapter III. Generator running and testing

Before we start with this let's make a final review.

The decomposing of the organic matter will generate gases, which will gradually increase the pressure inside the container. This pressure powers the air pump, which will make the alternator spin and generate electric power (110V). To first start the air pump we'll need to connect it to a different power supply that we call Temporary Unit. When the pressure reaches a certain point the pressure sensor cuts off the Temporary Unit power supply, which will make our generator independent.

The Temporary Unit is needed in order to power supply the air pump, which will accelerate the decomposing process inside the container and this way creating a bigger pressure in a shorter period of time.

We keep filling the container with leaves, banana peel. Using manure or urine is the best solution as they also accelerate the decomposing process.

You can check the chart to see the efficiency of each type of organic matter.

sawdust	8,660 Btu/pound
corncoobs	9,300 Btu/pound
coffee grounds	10,000 Btu/pound
wheat straw	8,500 Btu/pound
rice straw	6,000 Btu/pound
cattle manure	7,400 Btu/pound
bagasse	8,390 Btu/pound

Also make sure that the leaves you are using are damp. It usually takes about 24h until biogas is produced and another 2h to create the proper pressure inside the chamber in order to be able to use the system.



In his case we have used about 40 lbs. of grass, leaves and banana peel.

Place the lid on top after filling the container and make sure it is well fastened.

At this point our system is completely independent.

As you can see we have also put aside the Temporary Unit we have used to start the air pump.

We will be back after 24h because we have to allow the organic matter to decompose and generate enough pressure and gas to supply the entire system.

After 24h...

We will now start the generator by supplying 110V from a different power source for about 2h just to increase the pressure inside the chamber.

We return after 2h...

At this point you can see the system is working but is still connected to another power supply. We disconnect the power supply and the system keeps on running on its own. The system is independent and able to generate 110V.

You can see that the gauge is showing 110V independent form any alternative power supply.

Another important aspect is that the system is very quiet, it doesn't fume and it's portable. Its dimensions are solid and it can be carried in places where there is no electric power source like isolated cabins etc. The system can run on its own for about 48h non-stop considering the small amount of organic matter used and the small dimensions of the container.

We have also brought a microwave and a refrigerator just to show you that the system works wary well.

We will first heat some food in the microwave and then we will connect the refrigerator to the generator.

- FREE ENERGY -

This has been our project.

Thank you for being with us!