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Survival Essentials - Wood Gasifier

- Posted by [Lee Dalglish](#) on July 7, 2021 at 9:30am
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<https://www.youtube.com/watch?v=cMQpVtwBlik> *How to Build a Wood-Gasifier*

In this dstructable I will be showing you the steps I used to build my Wood/Biomass Gasifier. It was really a fun project and I would encourage anyone serious about preparedness to build one. Now in case you don't know what a Gasifier is (and don't feel bad if you don't its kind of idiot proof), they are quite simple, let me explain. Essentially all gasification is in a form of incomplete combustion, heat from the burning solid fuel creates gases which are unable to burn completely because of the insufficient amounts of oxygen from the available supply of air, it then filters these gasses(which is by weight: 20% hydrogen, 20% carbon monoxide, 50 to 60% nitrogen, and a little bit of methane) And you can really use any kind of Biomass(organic material) that will burn. You can even use things like paper, coal, peat, and lignite. You can

then use that filtered gas to run anything from a generator to a car. So now that you have a basic understanding of what gasification is, lets get down to the build!!!



Step 1: Basic Information.

Don't worry, for this project you wont need any fancy tools or equipment. Just a welder, an angle grinder, an oxy-acetylene torch, and a drill, along with the knowledge of how to use them. Most of the materials used were found in friends' scrap piles so for me cost wasn't a big issue. And you can (in theory) make this to whatever size you need, so keep that in mind when gathering materials. But don't forget, whatever fuel you use has to be able to feed through the fire tube easily. The fire tube acts as a dryer and hopper. The fire tube feeds the fuel into the shaker grate, which is where the fuel combusts. The gasses are then sucked out of the gasifier unit and pulled through the filter units. And after doing some research I chose to go with a cyclone filter and a media filter. Ideally I should have added a condenser after the cyclone filter to get as much moisture out of the gas as possible. But never mind the prototype works. I would though recommend adding one if you plan on building one of these.

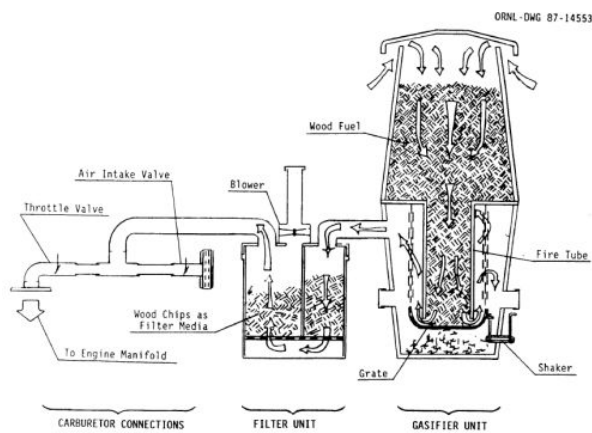


Fig. S-1. Schematic view of the stratified, downdraft gasifier.

The size of the fire tube governs the size of the engine you can run.



Here is a chart showing the fire tube sizes and the respective horsepower. The larger the fire tube, the more fuel it will burn, the more gas it will produce.

Inside diameter (inches) **Minimum length** (inches) **Engine power** (hp)

2, 16, 5 4, 16, 15 6, 16, 30

7, 18, 40, 8, 20, 50 9, 22, 65

10, 24, 80 11, 26, 100 12, 28, 120

13, 30, 140 14, 32, 160



Step 2: Building the Gasifier Unit.

The first thing you need (as with anything) is a solid foundation. Because I was dealing with scrap metal, the frame is made from 2" x 1" tubing and angle iron. I used a piece of 4.75" exhaust pipe for the fire tube, and the shaker grate is made from a brake rotor with the bottom cut out, and 0.25" rebar welded in place. The grate is suspended from chains welded to the fire tube supports. I left about 1" from the bottom of the fire tube to the bottom of the grate. I used 1.25" pipe for the ignition tube, which is that pipe leading into the side of the fire tube.

Everything on a gasifier needs to be air tight, which presented me with one of the main problems. How to get the shaker grate assembly through the side of the barrel and make it rotate while keeping it air tight, and it had to be heat resistant. My solution, was to run the handle rod through a piece of 0.75" pipe capped off on both ends,

and then pack that with fine steel wool. That seems to have done the job quite well. The purpose of the shaking action is to sift the ash and dead charcoal through the



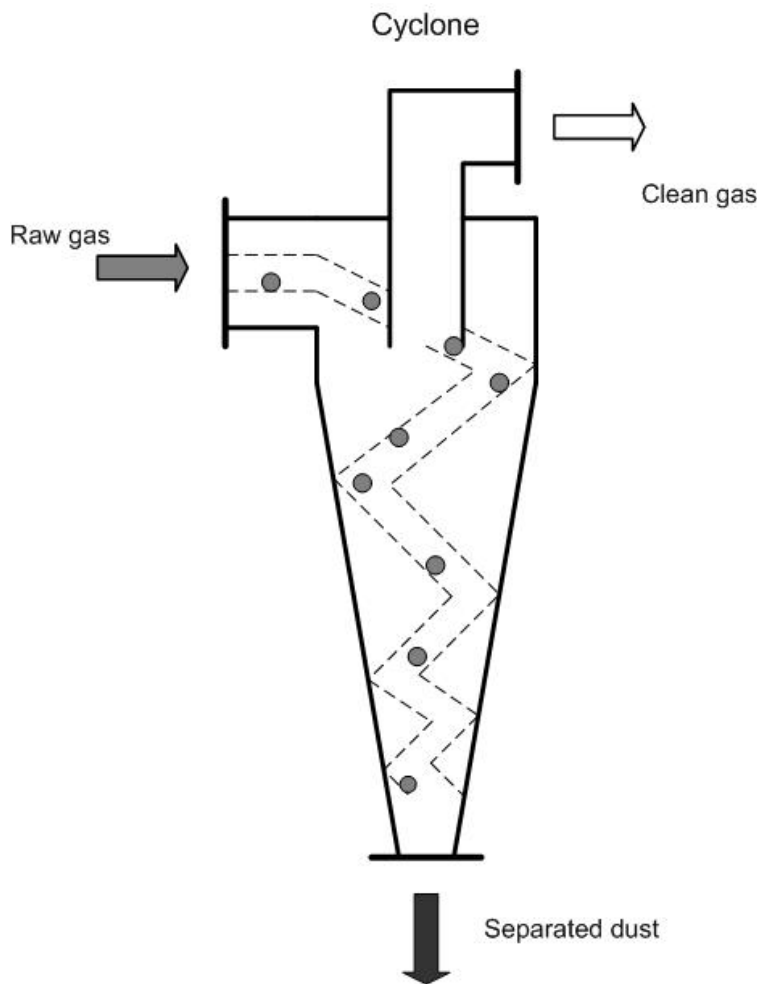
grate to make space for more fuel.



The ash clean out port is made from a piece of 6" pipe with a cover made from a 0.25" steel plate. I welded some lengths of 3/8" all thread to the sides of the 6" pipe and drilled corresponding holes in ears I left on the cover plate. I sealed it with wood stove gasket maker and cemented it in place with stove cement. Then you just bolt and unbolt the cover plate as needed.

The pipe you see going into the side of the fire tube is the ignition tube. Its capped off with 1.25" coupler with a washer welded on to seal it off, and I decided to add a handle to make it easier to use.

Step 3: The Cyclone Filter.



Okay, so far so good, that's the hard part over with. The filter units are the easiest part of the whole build. The first of the two filters is a cyclone filter which acts partly as a filter (obviously) and partly as a condenser. The water vapour, creosote, tar, and some particals are collected on the inner sides of the filter as the cyclone of gas spins. These then run down into the collection jar. I chose a 5 gallon propane tank as the filter housing. All I had to do was run a pipe from the gasifier unit in through the side of the tank at an angle, to initiate a cyclone. Then run another pipe through the top of the tank which sits about 2" from the bottom. I flipped the tank over and used the original top of the tank as the bottom of the filter. The threads from the valve hole accept a 0.75" pipe nipple, which is attached to a flange and bolted to a jar lid. I added a rubber gasket between the flange and the lid to make a nice air tight seal. Now just screw on the jar and tadaa, a catchment basin. That's really all there is to the cyclone filter.



Step 4: The Media Filter.



The media filter is made from a metal strong box tipped onto its side. The pipe leading through the top of the box comes straight from the top of the cyclone filter. Then you would just fill the box with an appropriate filter media such as wood shavings, cloth, or even as a more expensive but safer alternative, steel wool.

Next comes the plumbing. You can see the logic behind the pipe assortment there, but I'll explain anyway.



So first there is a tee which splits between the air pump and the outlet to the engine. The valves are for switching between the two as well as acting as a choke for the air pump. And the pump leads up to the flare. The purpose of the flare is to check gas quality before routing it to the engine.



I figured that in the apocalypse the chance of having a working wall outlet is pretty slim. So I chose to use an air pump that could run off of a 12v car battery. Nothing special, just an air mattress pump that connects to a vehicles power point.

Step 5: Tips on Using Your New Gasifier.

If you decided to reproduce this project, here are some tips and tricks to get you started. Firstly, the fuel you use must be bone dry, and I mean REALLY dry. Store bought wood pellets seem to do the trick nicely. I have an abundance of pillage, wood shavings, which I actually mix with dried leaves(70/30 due to high nitrogen levels in the leaves) but advise leaning off the mix at the carb least you'll keep fouling the plugs on the motor.

So you built a gasifier and want to try it out... Now what? First fill the fire tube with your fuel of choice, then simply turn the pump on(with lots of choke at first), then uncap the ignition tube, insert a source of ignition, let the fire catch, recap the ignition tube, and as the fire progresses let off the choke a little bit at a time. After it has been running for a while hold a flame to the end of the flare and, with any luck, the gas will ignite. Between the gasifier and the engine, the gas will need to be pre-carbureted, which is as simple as adding a tee in the hose to bleed off excess gas. Then you just run the line into the engine carburettor that's it!

It's an amazing feeling when this thing cooks up, kicks out the gas, and then in my case 4/5 pulls on the generator, a little adjustment and she roared into life.

Lastly I added a handle and some caster wheels, as well as sealing everything with wood stove sealer and giving it a coat or two of stove heat paint. This was a fun and very educational project, I would really encourage anyone who is interested in being prepared, or just looking for a fun project, to build a gasifier.

If you have any questions please let me know and I will do my best to answer them.

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proto-typing for a pick up truck present, bigger, better and more headaches:))



Comment by [Nick Shanks](#) on July 8, 2021 at 1:41pm

What a great tutorial Lee! I can't wait to study this more to see how you designed your gasifier.....

I have other build plans but this breakdown is most excellent with your explanations.

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