

The Backyard Biochar Retort Kiln

This low cost wood-fired biochar kiln can be even cheaper if you have some of the materials already lying around or if you have welding skills. The kiln uses any small dimensioned, dry feedstock that won't pack together - sawdust or wood chips are too small. Wood chunks, sticks or stalks will work better. The feedstock needs to be loaded into the retort with air spaces so the gas can vent. Depending on the feedstock, you can make 20–40 lbs of charcoal in 2-4 hours.



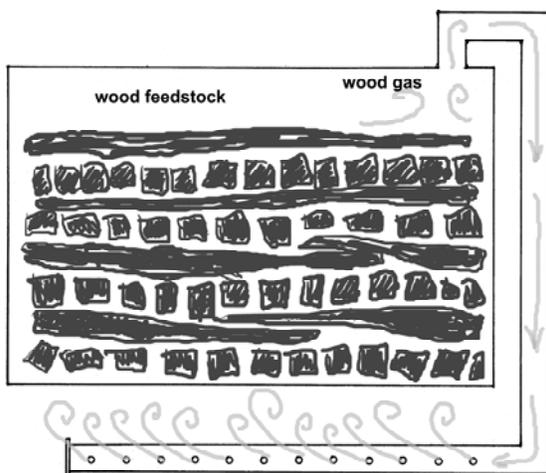
The loaded retort inside the kiln.



Wood gas burns in self-sustaining reaction.

How does it work?

The 55 gal drum is the retort. It is loaded with feedstock and then sealed, except for the vent. The retort is surrounded by a kiln made of cement blocks, to hold in the heat. You build a fire underneath the retort and keep it going for about an hour until the hot wood inside starts to out-gas. The gas vents through the tube under the retort and ignites. Once the gas is burning, you can stop feeding wood to the fire as the reaction is now self-sustaining. This process of baking biomass without air is called *pyrolysis*. Once the gas is all gone, you are left with charcoal.



A biochar retort

Biomass (such as wood) will produce gas when heated without access to air. The retort drum is sealed except for the vent. It is placed inside a brick kiln to help hold in the heat.

What do you need to make it?

Here is a list of materials you will need. You will need welding skills or a welder to make the vent pipe and attach it to the drum. You will also need a welder to make a metal frame to support the drum inside the kiln.

Bill of Materials for the Backyard Biochar Kiln

- cement blocks (70-8x8x16; 12-4x8x16; 6-8x8x8) \$170
- rebar: (9-pieces, 1/2" dia., 4 ft long) \$20
- oil drum with lid and clamp: \$10
- payment to welder: (includes materials for vent pipe and stand) \$200
- stove gasket (7 ft.) and stove cement: \$15
- fire brick: (22-4x9x2.5") \$40

Total: \$455

Some construction tips

Vent pipe: The bottom pipe is about 3 feet long, capped on the end with a circle of 1/8" metal tacked on. The holes are 7/16th inch with a 2.5 inch spacing. The pipe was 2 inch dia. thinwall irrigation pipe, but you could purchase 2" muffler pipe, or chain link fence post pipe, and maybe even have the muffler guy form radiused bends in it (rather than miter and weld the elbows).

Drum stand: We used welded bed rail, but found that it sags in the heat. Best to use something stouter. You could use galvanized pipe fitted together.

Fire pan: Lay the fire brick under the retort where you will build the fire. Place a piece of flattened stove pipe or other metal on top of the fire brick to help reflect the heat away from the cold ground.

Lid: Thread the rebar through the 4x8x16 blocks and rest the rebar ends on the walls. Use 3 pieces of rebar for each string of 4 blocks. Three strings of blocks will cover the kiln.

For more information:

For more information on this kiln see www.greenyourhead.com

Kiln design adapted from: <http://www.twinoaksforge.com/BLADSMITHING/MAKING%20CHARCOAL.htm>

Biochar science and news: www.biochar-international.org

Biochar kilns discussion group: <http://tech.groups.yahoo.com/group/biochar-production>

Stoves, including charcoal-making stoves: <http://www.bioenergylists.org/>

See www.spiralliving.org for updates on the Illinois Valley Community Biochar Kiln Project