

Three Can TLUD (Top Lit UpDraft pyrolytic gasifier)

Teacher's Guide

Materials:

- two 15-oz cans (most common, easiest to find)- opened, emptied and cleaned. These two cans will stack to make a chimney, so try to find two of the same kind that nest together for easy stacking. Try to find unlined cans, otherwise the plastic lining will burn off and make toxic smoke.
- one 28-oz can (very common - tomato sauce, pumpkin, many other veggies come in this size)- opened, emptied and cleaned.
- a nail
- a hammer
- three 6x1/2 pan head sheet metal screws
- a screwdriver to fit the screws
- a "church key" can punch
- a can opener
- a compass (optional)

NOTE: some cans are lined with plastic or coated with varnish. The cans will get hot and these coatings will burn off, making harmful smoke. It is best to start with uncoated cans.

Instructions:

1. Make the windscreen/ air intake

Take a straight edge and a marker pen and mark the bottom of the 28 oz can with 8 "pie slices". Use the church key to make 8 triangular holes at the marking points.



2. Make the pyrolytic combustion chamber

2a. Locate the pyro chamber legs. Take one of the 15 oz cans and mark 3 evenly spaced points around the bottom rim. Here's one way to do this: Find the radius with a compass. Scribe 6 points around the rim of the can and mark every other point.



2b. Install the legs. Take the hammer and nail and lightly punch 3 small holes in the can bottom near the points on the rim. Install a machine screw in each hole to make the legs of the pyrolytic combustion chamber.

2c. Make the primary air holes. Use the hammer and nail to punch primary air holes in an evenly spaced pattern across the can bottom.



2d. Make the secondary air holes. Take your 15 oz can and punch 8 evenly spaced holes around the top rim.



You now have a can with nail holes (for primary air) in the bottom, can punch holes (for secondary air) around the rim, and 3 feet made of screws. You can adjust primary air by changing the height of the screws. For extra fun, try making another can with a different primary air hole pattern and see what happens.

3. Make the Chimney

It's easy, just cut the bottom out of the other 15 oz can. Some 15 oz cans are constructed to nest with each other for easier stacking on the shelves, so if you have two that fit together, your chimney will hold together

4. Assemble the 3-can pyrolytic gasifier

Place the pyro chamber inside the windscreen/air intake.

Stack the chimney on top of the pyro chamber.



5. Lighting the 3-Can TLUD

Place the assembled 3-can TLUD on a fireproof surface such as a ceramic plate. Load 1 cup of softwood stove fuel pellets into the pyro chamber. This is your pellet stack. Soak a tablespoon of pellets in rubbing alcohol for ten minutes, drain and place on top of the pellet stack as an easy firestarter. Light with a match. After you have some experience with pellets, try some different fuels like twigs, nut shells, cones or seed pods.

6. How It Works

It will take at least 5 minutes for the heat to start drawing gas from the pellet stack. As the gas rises out of the pyro chamber, it ignites and the flame is sustained by the secondary air coming in from the can punch holes. This is helped along by the heating the secondary air as it passes up from the air intake around the pyro chamber. The flame is practically smokeless. When the flame dies out, all the pellets are charred and you can drop the can into a bucket of water to quench it. The last two pictures show the entire apparatus and the final yield of biochar to pellets which is about 50% by volume.



Take all appropriate fire safety precautions! Make sure that you have a bucket of water nearby to quench the biochar when the flame goes out, and some heavy leather gloves for handling hot cans.