"Ring of Fire" TLUD

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Apologies to Kelpie Wilson – she has already named a Ring of Fire Flame Cap Kiln.

Side by Side Comparisons for Improvements



TLUD Versions 6, 7 and 8

Heavy duty barrels with bottom removed for feedstock barrel. Save the lid for use later.



Primary Air Feed — first part. Capped on left end. Air holes in both sides. Primary air feed holes and on the right airtight stoppers. Weld into place in barrel — must be airtight!





Row of holes on each side





Primary Air Feed — second part. Top is marked with a grid, 3/8" holes drilled on centers. Bottom has four feet to hold it above the primary air feed tube.

Handle



Support legs



Use of a Smoke Pencil to track air distribution.



Smoke Pencil

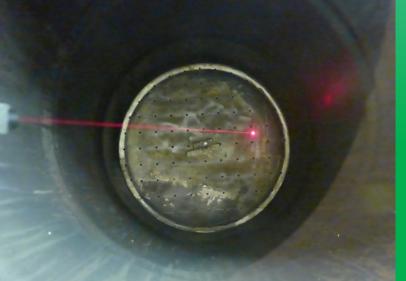
Smoke pencil in Primary air Tube





Laser showing no smoke in feedstock barrel

Laser showing smoke in feedstock barrel



Primary Air Tube cap and gasket

Primary Air Intake Holes w/ Stoppers

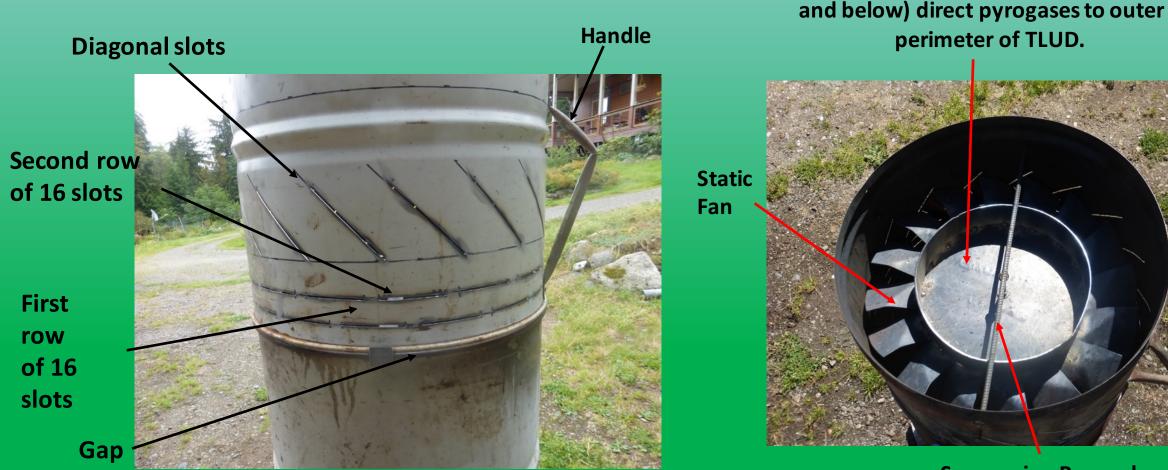




Gap for secondary air between the afterburner and feedstock barrel.



Afterburner – gap and slots for secondary air



Suspension Bar - rebar

Bluff body and two collars (above

Feedstock Barrel with wet woodchips.





If wet woodchips are pyrolyzed, the result is enormous amounts of smoke and atmospheric pollutants and a depressed temperature.

> Do not attempt to make biochar with wet wood!

Feedstock barrel filled with wet woodchips. On primary air tube, add a sheet metal plenum and a 1kW carpet dryer.



Shrouded fan to draw air up thru woodchips. Plug the fan and carpet dryer into an electrical timer.



Spring wound Timer to **Shrouded Fan** turn off the fan and dryer



Water heater blanket – R10 (with a little quilting from my wife).

Heat and forced air from the carpet dryer and suction from the shrouded fan will dry the woodchips in hours.



After the chips are dry; a. remove the blanket, b. remove the fan, c. remove the carpet dryer, d. remove the plenum.





Light the fire, remove stoppers and replace airtight cap.









Start of pyrolysis.

Laminar Flames at secondary air gap between the afterburner and feedstock barrel.





This is a Ring of Fire!



As pyrolysis nears the end, restrict the primary air even more and more.



As pyrolysis nears completion, use <u>double</u> layer of wet carpeting to cool the drum and activate the biochar. Double layer of soaked carpeting works best.







When pyrolysis is complete, put on a lid with clamps. Let it cool and walk away! -





But! If there is a 1/8" air leak some place in primary air or the lid, the biochar will combust and the carpet is toast!







This is a Ring of Fire TLUD!



This *Ring Of Fire TLUD* accomplishes several things.

First, it makes a quality biochar.

Second, construction is straightforward and relatively inexpensive - less than \$250 for basic raw materials especially if you buy at my favorite industrial supplier - Goodwill. Any good do-ityourself homeowner workshop is more than adequate for construction especially if you can do some wire-feed welding.

Third, it has a good yield of close to 30% with a greater total yield than a Jolly Roger TLUD. There is less ash if the operator knows when to stop pyrolysis.

Fourth, the feedstock barrel is used to both dry and pyrolyze the woodchips making the TLUD more ergonomic and much more labor efficient.

Fourth, operation of the *Ring of Fire* TLUD is considerably safer than trying to manhandle a very hot heavy 55 gallon drum dumping and quenching hot biochar. Really important!

Fifth, this is not a 20% primary air Jolly Roger TLUD. Actual measurements of the amount of primary air show it accomplishes a good clean efficient burn with % primary air.

Sixth, in the world of open combustion, TLUD's burn very cleanly through *intermediate pyrolysis*. In the scientific literature, TLUD's are defined strictly as *"packed bed combustors"*. The TLUD is filled with chips and combusted in place.

However, in actual function according to (Basu, P. (2006). Combustion and gasification in fluidized beds. CRC), TLUD's more closely resemble fluidized bed combustors where atmospheric nitrogen is the "fluid", used to carry the oxygen to pyrolyze the woodchips. Fluidized bed combustors have a unique characteristic in that they can become extremely hot. We have measured temperatures as high as 840°C in the afterburner! Metal in the afterburner start to soften. Temps do not need to be this high! Regulate the primary air up and down carefully! TLUD's apparently are fluidized bed combustors.







