

“Ring of Fire” TLUD

Norman Baker and Paul Taylor



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!



Welded cap



Row of holes on each side



Primary air holes

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



Airtight Gasket

Gap for secondary air between the afterburner and feedstock barrel.



Afterburner – gap and slots for secondary air

Diagonal slots

Handle

Second row of 16 slots

First row of 16 slots

Gap



Bluff body and two collars (above and below) direct pyrogases to outer perimeter of TLUD.

Static Fan



Suspension Bar - rebar

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.

Sheet metal plenum



One kW Carpet Dryer



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



Shrouded Fan



Spring wound Timer to
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 double 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-it-yourself 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.



