

FC Tub Char-Makers

A Report by Paul Anderson, 2 October 2016

<http://drtlud.com/resource/prt16810>

1. My friend Bruce Southerland in New Hampshire is a charcoal enthusiast. He sent me a photo (Figure 1) of char-making in a tub or short barrel. It uses the FC (Flame Cap) technique to accumulate char in the bottom of the tub, away from any oxygen. He said that the inclination of the tub is important.

2. While at Las Cañadas permaculture ranch in Veracruz, Mexico in September 2016 for a week-long Biochar and Gasification workshop (similar to Stove Camps), I had a chance to try the FC Tub approach. One 200 L (55 gal) steel drum (closed at both ends) was cut along one of the expansion ribs, creating two tubs equal to $1/3^{\text{rd}}$ (almost 70 L and 30 cm tall) and $2/3^{\text{rd}}$ (nearly 140 L and 60 cm tall) of the full drum. Both were tried for FC Tub production of char. The main fuels were dry bamboo and sticks with diameters of 2 to 7 cm, but other biomass was also used with quite similar success.

3. The shorter, 70 L tub (Figure 2) functioned very well when placed at an approximately 45-degree tilt. When there was a moderate amount of char created (about $1/4^{\text{th}}$ to $1/3^{\text{rd}}$ of tub capacity), the tub was righted with no tilt, and the feeding of the fuel was continued without interruption until it was quite full.

4. The taller tub (Figure 3) needed to be tilted about 60 degrees so that sufficient air could enter to sustain the Flame Cap (FC) combustion of the created gases. The cap of flames was longer in its horizontal dimension as the air swept inwards, but also the pieces of fuel were longer. When the fuel extended outward from the lower lip of the tub, it did not burn because of the clearly evident strong inward flow of air.

Those pieces were pushed into the tub when the inside ends were pyrolyzed and broken off.



Figure 1: A Flame Cap (FC) Tub Char Maker, by Bruce Southerland, NH. (approx. 2015)



Figure 2: This FC tub is $1/3^{\text{rd}}$ of a 200 L barrel in Mexico.

5. Also noted with the 60 cm tub was that any exposed char (without flame cap) at the lower lip and inside of the tub was being char-gasified (oxidized and turning to ash) by the in-rushing air. When observed, the user should push the char further into the tub and place raw fuel near the lip. When this is not convenient, make the tub more upright, and eventually fully upright for the final fueling and char creation. This observation suggests that FC production of char might be possible in a full-size barrel (open at one end) that is started when tilted nearly onto its side, perhaps 75 degrees from vertical. Because the FC technique requires some air circulation over a lip or edge, I suggest placing perhaps 15 or 20 liters of already-created (even cold) char into the barrel as a bed for the initial fuel. This has not been tried, so please report your experiences to the Biochar Listserv (groups.yahoo.com/neo/groups/biochar/info) and elsewhere.



Figure 3: This FC tub is 2/3rd of a 200 L barrel. For initial use, the barrel was inclined and supported with stones and blocks placed underneath the ribs.

6. In these preliminary trials for the tubs, the weights of the fuel and the resultant char were not taken, so there are no quantitative results. However, all appearances were quite similar to char produced with the same supply of fuel pyrolyzed in the locally made FC trough char maker (visible in Figure 4, and discussed in a separate document).



Figure 4: Two FC tubs from one 200 L barrel and a FC trough with 600 L capacity in the background.

7. Because the fuel pieces (bamboo mainly) were large, the operators of the two FC tubs and the one FC trough commented that they liked the trough better. However, with different fuels and/or in different circumstances (such as in a residential backyard), the FC tub devices and methods for char making should be quite useful. And tubs are certainly less expensive and more easily obtained than FC troughs. One barrel could become two equal-length 45 cm tall FC tubs.

8. If FC tubs become an acceptable method for making char, consideration should be given to the design of tub supports (legs, brackets with pivots, handles, etc.) for user convenience. Also, use of the created heat should be explored, such as heating water via a hood with a chimney.