Briquette Production Process Report

Equipment

1. Steel oil drum (55 gallon or similar)
2. Biomass (agricultural waste such as risk husks, coconut husks, etc)
3. Three bricks
4. Large bags to crush charcoal in
5. Starchy mixture
6. A briquette press (see design)
7. Square tile the size of the hole on top of the barrel

Method

Carbonisation of coconut husks:

1. Set up 3 lots of 3 bricks on top of each other and dig hole in the middle.
2. Create a teepee of little dry twigs in the middle hole and ignite toilet paper in the middle of the teepee.
3. Keep adding dry fuel to get the fire very hot and consistent.
4. Add dry palm leaves in the little holes underneath the barrel.
5. Put the barrel on the fire so the fire underneath (where the teepee was made) lights the dry palm leaves.
6. The coconuts (dried) in the barrel should start to smoke now.
7. Add some fire (light toilet paper) in the big hole on top of the barrel.
8. There should be thick smoke and a fire coming from the top.
9. After 10 minutes use a large stick with two people to edge the barrel to one side and kick off the 3 lots of 3 bricks off so the barrel is flat on the ground (to stop O2 coming from under).
10. Cover the big hole on top with a tile and seal it off with wet mud.
11. Leave the barrel for 2 hours so the coconuts can finish carbonising.
12. Remove the tile and put the carbonized coconut husks in a hessian bags.

Slurry composition:

1. Boil water using a kettle.
2. Mix boiling water with corn starch in a bowl.
3. Stir liquid starch mixture with spoon.
4. Pour mixture into the crushed carbonised coconut husk.
5. Create the slurry of carbonised coconut husk and starch as a binder using hands. Mix thoroughly and be wary of burning from hot water.
6. Clump the slurry into approximate cylindrical shapes about the size of a fist.

Results

- Carbonised coconut husks ended up being 0.9kg in weight.
- Container weighed 1.9kg.
- Crushing the charcoal was not comprehensive, and is very difficult to make comprehensive through manual means. There were often hidden chunks uncrushed underneath the powder.
- There was occasionally non carbonised or incomplete carbonised coconut husk which were removed.

- Starch mixed well with the carbonised charcoal but once cooled the mixture did not bind as well.
    - It appeared that more starch was needed to maintain cohesiveness.
    - Lots of residue came from the briquette production process.
- Sugar cane was also burnt to carbonise, however it did not take off as too wet.

Observations

What worked well/ what needs to be improved post burning coconut husks:
The charcoal was crushed up in hessian bags using a mallet and just stomping on it. It worked pretty well except there was still some hard residues which needed to be squashed by hands. The uncooked coconut husks were just disregarded.

The corn starch was then mixed with hot water. The hot water made the starch clump up however it did secrete a sludgy/ sticky substance good for mixing and holding stuff together. For future reference I recommend adding the hot water into the bowl first and then slowly sifting the corn starch into the bowl while stirring. Also, adding cold water to the starch did not cause the starch to clump and ended up mixing well however the starch solution was nowhere near as thick.

Tests should be run to see which starch method is more efficient as a coagulating agent.

The briquette pressing machine worked relatively well initially. After various testings the fastest method to get the briquettes out was just to use a square shaped broom and push the briquette out through the tube.

Problems encountered with the briquette press was that after a certain pressure was applied the charcoal slurry would start backfilling the press as the tube and press were not a perfect fit. Some charcoal also started pouring out through the hole at the very bottom of the metal L-joint used to block the charcoal from pouring out.

Finally, the press machine ended up breaking after a while where the rod and cylinder used to press the charcoal disassembled and in turn the briquette could no longer be pressed effectively. One way of overcoming this could be to increase the hole size of the L-joint so that the rod would be able to go through the briquette and out the other end. Then the metal circle could go on to press the briquette and expel the remaining water out.

Testing Briquettes

The briquettes need to be tested for their effectiveness. Before they are to be tested, they need to be dried. Drying will be undertaken via use of the New Lao Stove until the briquettes are determined to be dry enough.The briquettes will then be tested in terms of how easy they are to light on a scale of 0-5 where 5 is very easy (lights instantly just using a match flame) and 0 is doesn't light. The briquettes will then be tested for how long they are effective for via stopwatch and how much heat they give off via boiling water. 1 L of water will be boiled using a New Lao Stove. The time it takes to boil this much water will be recorded.