

January to June 2015

Patung-Patong: The Brick Stove Carbonizer; Food Business Model

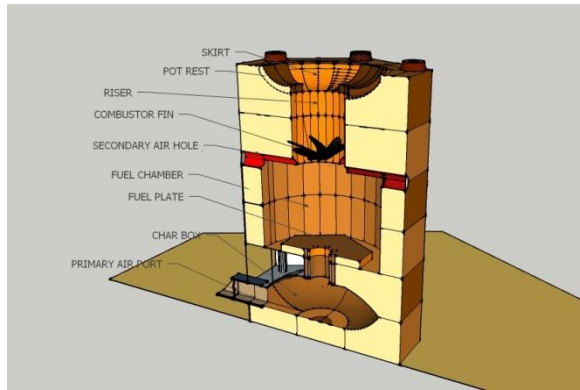
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- This project is my attempt to contribute to the pool of knowledge on how to create a stove that
 - Runs as a TLUD gasifier and as a rocket
 - Runs on a continuous mode
 - Makes biochar
 - Is built with a combination of metal and clay
 - Is fuel efficient and with clean emissions

Patong patong is a Filipino adjective to describe objects that are on top of one another. This refers to the manner the bricks are assembled to create the stove.

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- In 2014, the stove i built cannot be moved about to another location. Otherwise, it would require another round of dismantling and then installation.

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- I found a 60 liter metal drum with dimensions that is perfect for the brick stove to be set in.

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- Another challenge i faced is the air control for a ceramic stove. Unlike metal, bricks are difficult to be attached with a moving part such as a air control gate.

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- The stove can run during the first phase in a TLUD gasifier mode and then during the succeeding mode in a continuous mode. It can be fed on the side through a receptacle with granular fuel or wood sticks. This photo shows the canarium shells on the side feeder.

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- A year before, i tried creating plugs made of extra hardened plaster. The abrasions between the plaster and the ceramic body causes leakage. One remedy is to attach it with gasket and so it allowed a very tight fit to the stove wall. The plug would seal off the air for a char box but would not allow minute air openings during gasification.

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- After several weeks of trials, i finally settled with the use of ash, fine sand or grog and have a receptacle at the fuel port installed. The grog was poured on the receptacle effectively seals off the air.
- To allow air to enter again, a fresh opening may be simply be poked by a stick.

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- Still, i anticipate the inconvenience that it may cause whenever the ash, or sand or grog will have to be poured or scraped off.
- This will be the subject of the next round of innovations.

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I also fabricated a new set of pot rest to protect the bricks from the heavy pots and wok. The pot rest does not touch the bricks and instead the metal drum.



It safely and effectively receives large vessels such as wok and pots while maintaining the good contact with the flames.

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- After several months of tests and renovation, the brick stove now emerged as a mobile and well protected piece of equipment that is ready to serve food business sector.

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- On 25 May, 2015 the first actual cooking test was done at Barangay Pamorangon, Daet, Camarines Norte, Philippines.
- It was with a banana cue vendor who cooks more than 5 kilograms of banana and sweet potato delicacies almost daily.



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- Ate Virgie as i fondly call her, cooks on her conventional cement stove with coco shells. The cement stove is low on the ground and that she has to stoop down and thus exposes her face and body to the heat.
- She uses an average of 35 pieces of coco shells daily which she buys from the public market at PPhp 0.40 per piece.
- She complains about inhaling a lot of smoke every time she cooks plus the heat fatigue
- She cooks as much as two hours during weekdays.

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- With the stove carbonizer, here are some of the results.
- 1. She is very pleased with the stove. She does not have to stoop down and avoids the heat fatigue because of the comfortable height.
- 2. The wok snugly fits onto the stove top and thus is very safe against accidental fall. She has a limited space and her grandchildren is always playing around.
- 3. She used only 23 pieces of coco charcoal instead of 35.
- 4. There is much less smoke.

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- 5. For the entire duration of cooking lasting for about 1 ½ hours, the stove was loaded only twice. The first is with 20 pieces of coco shells which ran for about 1 hours 15 minutes. And then the second load is 3 pieces of shells for the finishing batch of the banana cue for the last 15 minutes in a **continuous mode**. Total weight of the fuel used is 2.04 kg.
- 6. The hot char was left on the stove. Both the fuel port and the ash ports were sealed with sand while leaving the secondary air ports and the top of the burner open. The following morning, almost no char was harvested. **Improvements will have to be made to collect the hot char.**
- Ate Virgie wants a kindling material that is easy to light on top of the fuel batch.
- 7. She also wants an air control mechanism that is easy to use, such as a metal door.
- 8. She hopes that the price would eventually drop so she can buy this stove.

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- Next Steps
 - Improve the air control mechanism.
 - Prepare a ready to use kindling material.
 - Install a gas mixer following the work of Kirk Harris
 - Run the secondary air through the stove walls as advised by Joe James
 - Run more test using wood sticks, bamboo sticks, chopped pine needles, rice husks, saw dust.
 - Have the stove tested using the prescribed protocols on safety, emissions, efficiency and others.
 - Conduct more tests with other food entrepreneurs and for at least five hours in a continuous mode.

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Going back to the questions of 2014,
Questions:

1. How can this stove model perform as good as its metal counterpart of the TLUDs? ***This new model integrates the best of metal and clay. The stove walls do not heat up as metal would. It would also cost a fraction of a stove made of steel.***
2. Can other kinds of found fuels be used as fuel as well? If so, how? ***I tested it with canarium shells and it performed even better than the coco shells. I am very confident it will also work with pellets, wood sticks, coco palm fronds and other similar fuels.***
3. What is its efficiency? What is its fire power? What are its levels of emissions? ***Will know this after after running trough a series of tests which i am not yet very competent of doing. For this i need help.***
4. How long will the stove last? ***Possibly more than 5 years for the bricks and about 3 years for the drum and one year for the metal pot rest.***
5. How much will it cost ? ***Estimated selling price at Php 3,344.00. (\$76.00). It can also be fabricated at any community with a supply of good clay. I would also be happy to provide skills training services on building this stove as my source of income.***

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- More Notes
 - Operating the gasifier stove requires a new set of knowledge and skills for (1) priming the fire from the top and then (2) regulating the air flow at the fuel ports, (3) feeding fuel on a continuous mode and finally (4) sealing the air ports to harvest the biochar. It is an entirely new procedure for most of the users and thus require learning outside the conventional stove procedures.

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THE STOVE CARBONIZER

- For the next episode, this smaller kitchen model will be tested on selected households.



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**Thank you very much
for viewing !!**

