

Biofuel Project

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What is our idea?

- Our goals: redesign a grinder and mechanism that allows for the Women's Cooperative Factory workers to convert local crop waste (**peanut shells**) into biofuel for cooking.
- Previously, a senior design team implemented a grinder and press mechanism that was powered by bicycle. The workers had no experience riding bicycles which made the mechanism difficult to operate.
- To counter this issue, we wanted to come up with a new/ergonomical method to operate the grinder. One that would reduce the difficulty of operation as well as the physical strain of the labor.



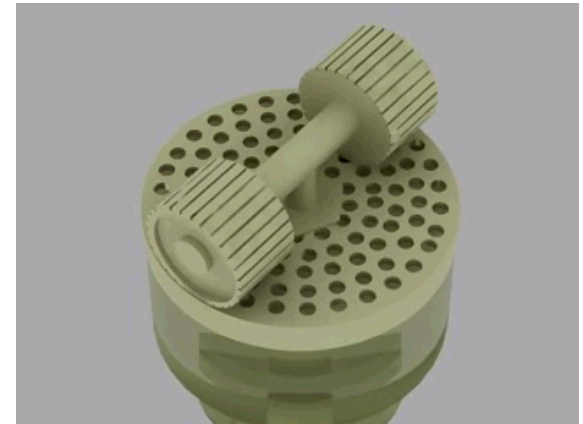
Video of implementation



Inspirations

- Project concept taken from Sawdust Pellet Mill
- Machine takes biomass and turns it into pellets which can be used as biofuel
- Grinder mechanism converts material into fine pieces
- Engineers without Borders Project

Consists of a hand crank, concrete grinder, concrete wall and wooden materials

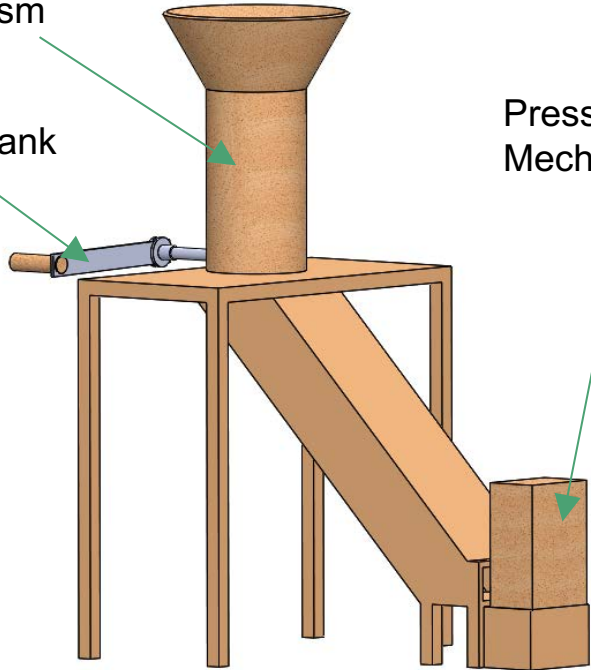


Our Design Concepts and Features

Grinder
Mechanism

Hand crank

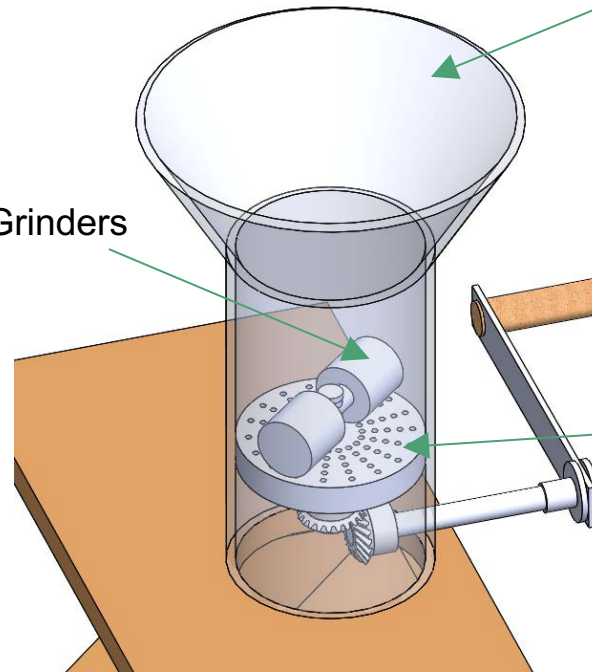
Press
Mechanism



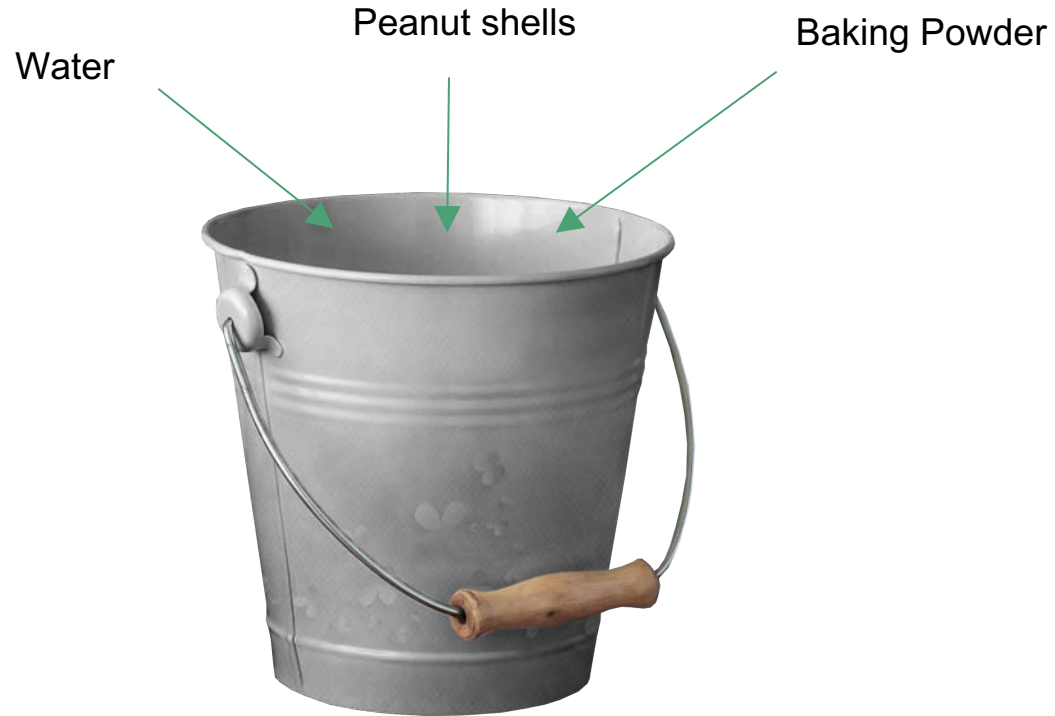
Funnel

Grinders

Grinding Die



Mixture before press



Fuel from Peanut Shells

- Peanut Shells are extremely flammable with long burning time
- Formed into pellets/briquettes and burned
- Easily collected and stored



Green Engineering Design Principles

1. Inherent rather than circumstantial
4. Maximize mass, energy, space & time efficiency
9. Minimize material diversity
10. Integrate local material
12. Renewable rather than depleting material & energy



Impacts of Our Product

→ Social

- ◆ Generating livelihood
- ◆ Learning how utilize waste for energy
- ◆ El Cercado locals can teach other communities
- ◆ **Locals may believe that all waste can be utilized as biofuel**

→ Economical

- ◆ Cheaper to use the waste rather than purchasing a different resource
- ◆ Generate revenue from selling briquettes

→ Environmental:

- ◆ Better than using wood which increases deforestation
- ◆ Peanuts ripen quicker
- ◆ **However, using peanut shells still emits CO²**



Key Implications

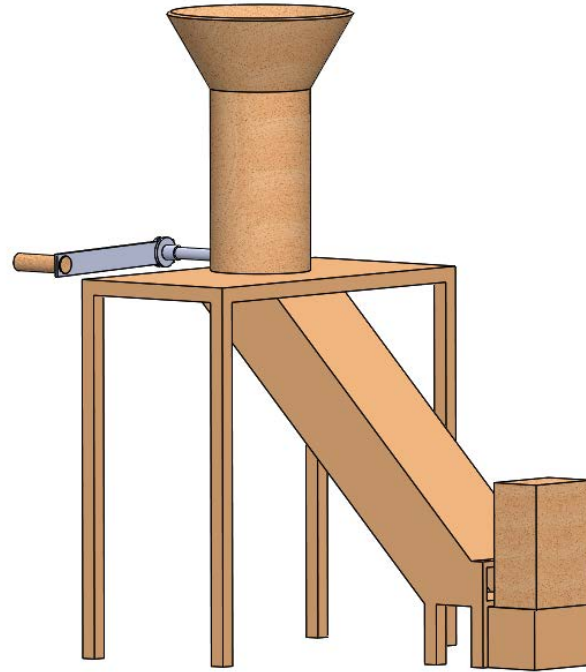
Why is this better?

- Local baking powder Sodium Pyrophosphate vs. Corn Starch.
- allows control of amount that will be used
- Pellets are easy to collect, store and sell
- Pieces can be disassembled and recycled

Sketch

→ Parameters:

- ◆ Funnel
 - Diameter: 6 inches
 - Height: 17 inches
- ◆ Table
 - Height: 2 feet
 - Width: 4 feet
- ◆ Crank
 - Diameter: 1 foot



Cost Analysis

Grinder materials: \$500

Press mechanism: \$100

Transportation: \$4000

Upkeep/repair: \$200

Total: \$2800



Conclusion

- More ergonomic/energy efficient grinder
- Create more efficient fuel from food wastes.
- Set users up for sustainable work in future (ease and simplicity)
- Safety and environment



Sources

Recycling Concrete: How and Where to Reuse Concrete <https://www.thebalance.com/recycling-concrete-how-and-where-to-reuse-old-concrete-844944>

National Peanut Board. <http://nationalpeanutboard.org/peanut-info/how-peanuts-grow.htm>

Engineers without Borders <https://drive.google.com/file/d/0B12WsCOCGAvKWld0ZUtNMS16UVU/view>