Prototyping Modifications for Sun Buckets Cooking and Heating Systems

By Lily Weaver

Key Results

- **Integrated hot plate** would allow users to cook with hot plate when electricity (such as from solar panels) is available, or store thermal energy for later by charging Sun Buckets
- **Possible space heater** designs: Sun Barrels (larger Sun Buckets with fans) and/or Sun Blankets (PCM blankets)
- Sun Buckets are solar cookers that use phase change material (PCM) to store solar energy
- They reach temperatures around 340 °C and can store thermal energy for hours after charging
- Users in India were interested in automatic charging method and space heater based on similar technology

Methodology and Approaches

- Met with Sun Buckets teams in India and Kenya to learn more about needs and circumstances of end-users
- Used SketchBook to draft various potential designs for hot plates, Sun Blankets, and Sun Barrels
- **Design highlights:**
  - Hot plates connect to thermocouples in Sun Buckets, turn off when Sun Buckets are finished charging (automated charging)
  - Sun Blankets and Sun Barrels both have electrical charging methods
  - Sun Barrels are topped with thermoelectric generator-powered fan and a lid which directs air outward instead of up

Future work:

- Build and test prototypes of hot plate and space heater
- Meet with potential users to receive feedback

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Can Sun Buckets be redesigned to better meet cooking and heating needs?

Fire is commonly used for cooking and heating in the energy-impoverished areas

- Inhaling smoke often causes health issues such as asthma for women and children
- Smoke and soot from cooking fires accelerate ice melt and global warming

Figure 1. Indoor cooking over open fires produces large amounts of smoke and soot, http://www.cleancookstoves.org/

Figure 2. Diagram of Sun Buckets stored solar cooker, https://youtu.be/MG4YpH887Iq

Figure 3. Sun Buckets hot plate

Figure 4. Sun Blankets

Figure 5. Sun Barrels

Figure 6. When charging Sun Buckets outdoors, parabolic dish must be adjusted every 15 minutes, https://youtu.be/MG4YpH887Iq