

CENTER FOR POWER OPTIMIZATION OF ELECTRO-THERMAL SYSTEMS

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Prototyping Modifications for Sun Buckets Cooking and Heating Systems

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



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

- 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

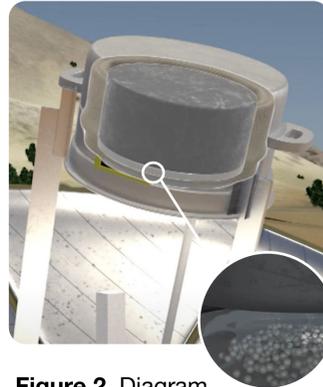


Figure 2. Diagram of Sun Buckets stored solar cooker, https://youtu.be/Mr0_tIQYP88?t=609

- **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

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

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)

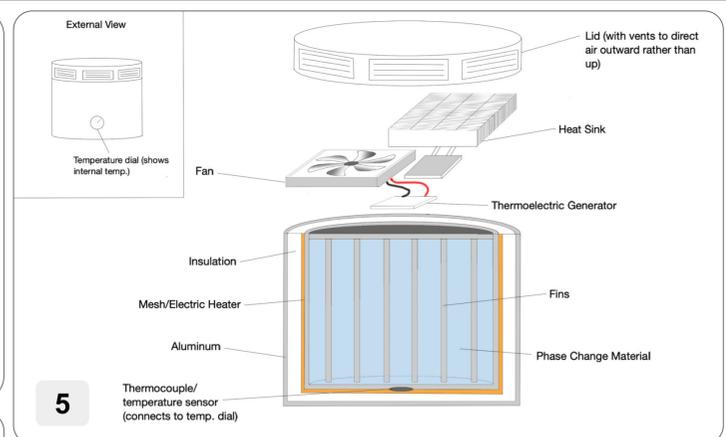
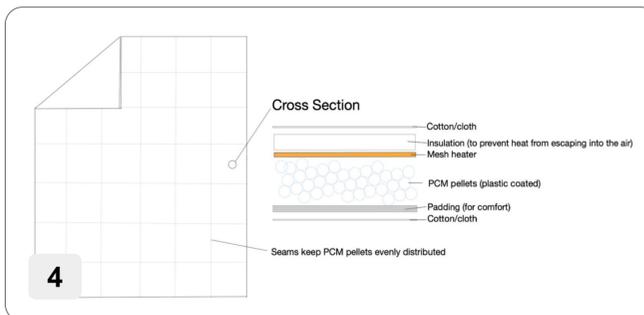
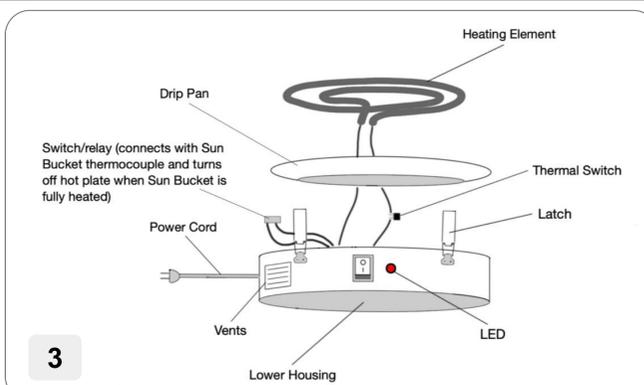


Figure 3. Sun Buckets hot plate

Figure 4. Sun Blankets

Figure 5. Sun Barrels

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 connects 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



Figure 6. When charging Sun Buckets outdoors, parabolic dish must be adjusted every 15 minutes, https://youtu.be/Mr0_tIQYP88?t=609

Future work:

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

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