

# Optimization of the Design of a Solar Oven for Refugees Use in the Kiziba Camp, Rwanda

School of Science, Engineering, and Health Symposium  
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## Problem Statement



The team is designing a solar oven to be used in a franchise business model for refugees in Rwanda. The oven will render tallow that can be sold to soap and candle manufacturers to provide income for refugees.

## Client

Our team is working with Dr. Michael Pucci, the Executive director of GO ED. The oven will be used by persons in the Kiziba Refugee Camp in Rwanda.

**GO ED.**



## Specifications

An ideal Solar Oven will...

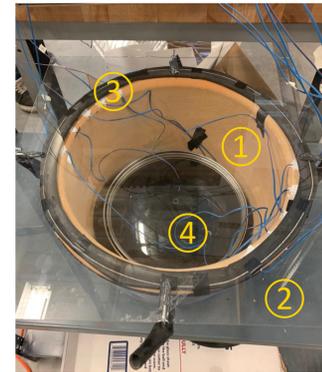
1. Be manufactured with locally sourced materials
2. Cost less than \$12
3. Reach an internal temperature of 300°F

## Goals

Our goal is to create a working solar oven that will reach 300°F and render tallow. To achieve this, our short-term goals are to optimize the pot and reflector design and use experimental data to model heat transfer.

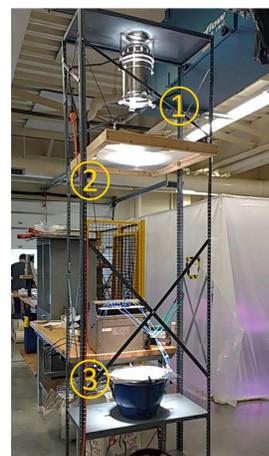
## Current Design

The current prototype consists of a clay pot ① with a glass lid ② that is sealed by a rubber bike innertube for a gasket ③. The cookpot ④ sits inside the clay pot and the air trapped around it with the direct light heats it up. The wires in the photo are the thermocouples used for heat transfer analysis.



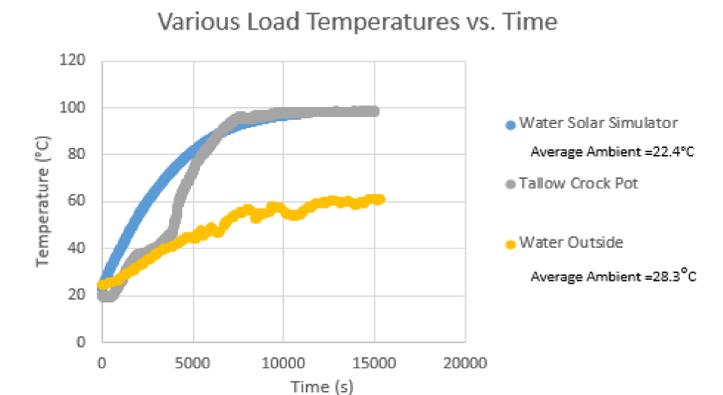
A reflector will sit on top of the glass lid during normal use, but this was removed for the picture. An Excel document has been created to output reflector dimensions based on the efficiency of the pot assembly.

## Solar Simulator



The solar simulator consists of a light source (a 1000 Watt tungsten spotlight) ①, shining through a Fresnel lens ② focusing the light into the solar oven ③. The goal of the simulator is to model the irradiance of the sun as closely as possible, so it is designed to provide 1000 watts per square meter. Performance verification is ongoing.

## Heat Transfer Analysis



- **Tallow Crock Pot Test:** wet rendered 1L beef suet and 250mL water in crock pot, temperature leveled out at 100°C.
- **Water Solar Simulator Test:** 1L water, indoors in simulator, temperature levelled out at 97.5°C.
- **Water Outside Test:** 1L water, small reflector with 2 sq. ft. capture area, temperature levelled out at 61°C until interrupted by precipitation.

## What's Next?

- Test various reflector designs
- Test different types of insulation
- Use solar oven to render tallow
- Potential site team trip

## Acknowledgements

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