

# Solar Autoclave for Rural Areas

## Progress Presentation

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# Presentation Overview

- ▶ Problem Statement
- ▶ Need Identification
- ▶ Final Design
- ▶ Manufacturing Process
  - Trough
  - Boiler
  - Pressure Vessel
  - User Interface
- ▶ Gantt Chart
- ▶ References

# Problem Statement

- ▶ **NEED STATEMENT**: Certain developing areas around the world have limited availability to sterilized medical equipment.
- ▶ **OUR GOAL**: To create a solar autoclave that can be easily used at remote clinics in rural areas.



Figure 1: Western Design Autoclave

Source:

[http://www.trojanmedical.co.za/?page\\_id=205](http://www.trojanmedical.co.za/?page_id=205)

# Need Identification

## ▶ Objectives

- Provide remote clinics in rural areas with the means to sterilize medical equipment
- Create a flexible design from location to location
- Parts can be repaired/replaced from local, readily available materials

## ▶ Constraints

- Temperature must reach and hold 121°C for at least 15 minutes
- Pressure must reach and hold 2.05 bar for at least 15 minutes

# Final Design

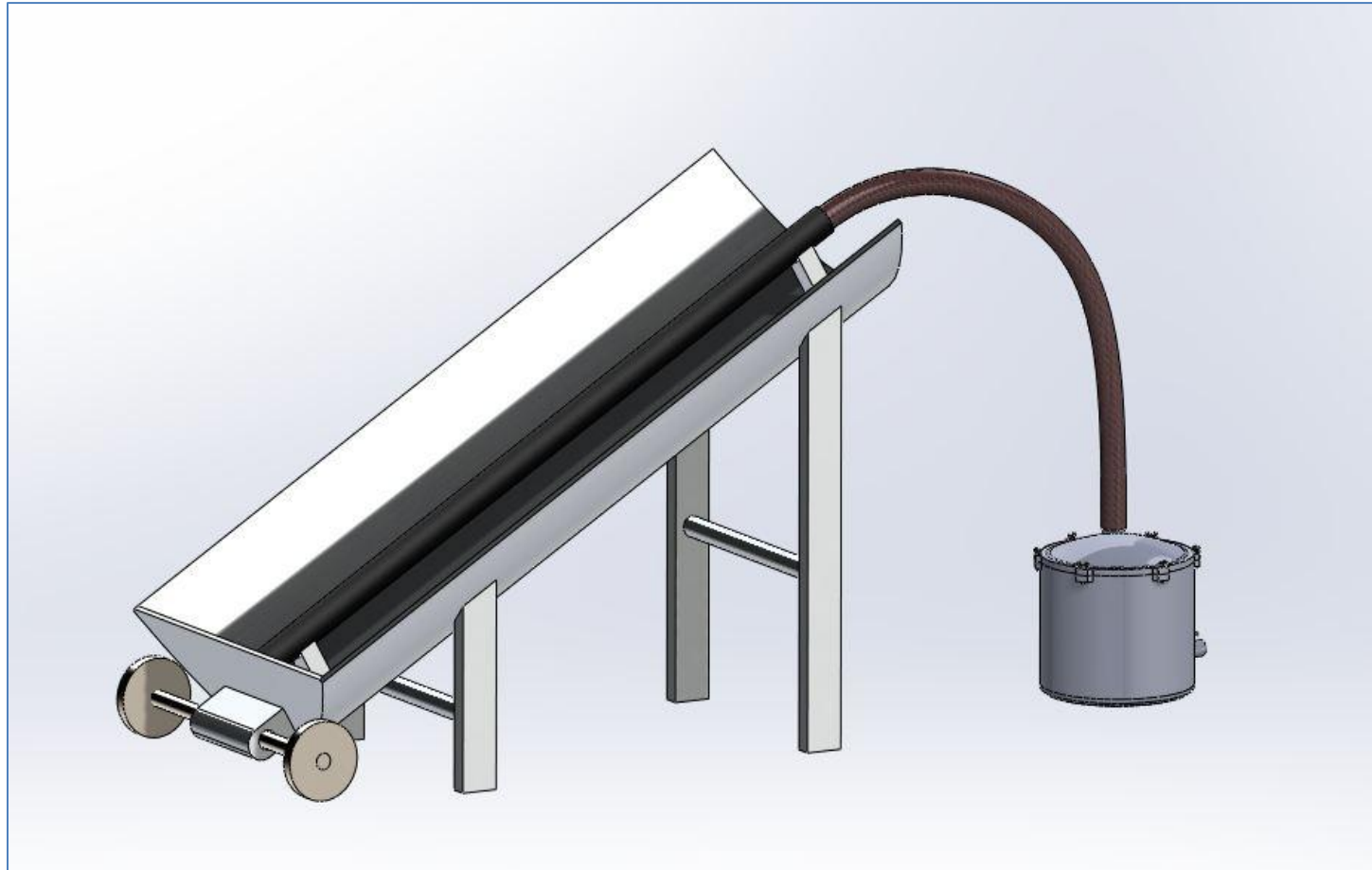


Figure 2: Final Design

# Final Design

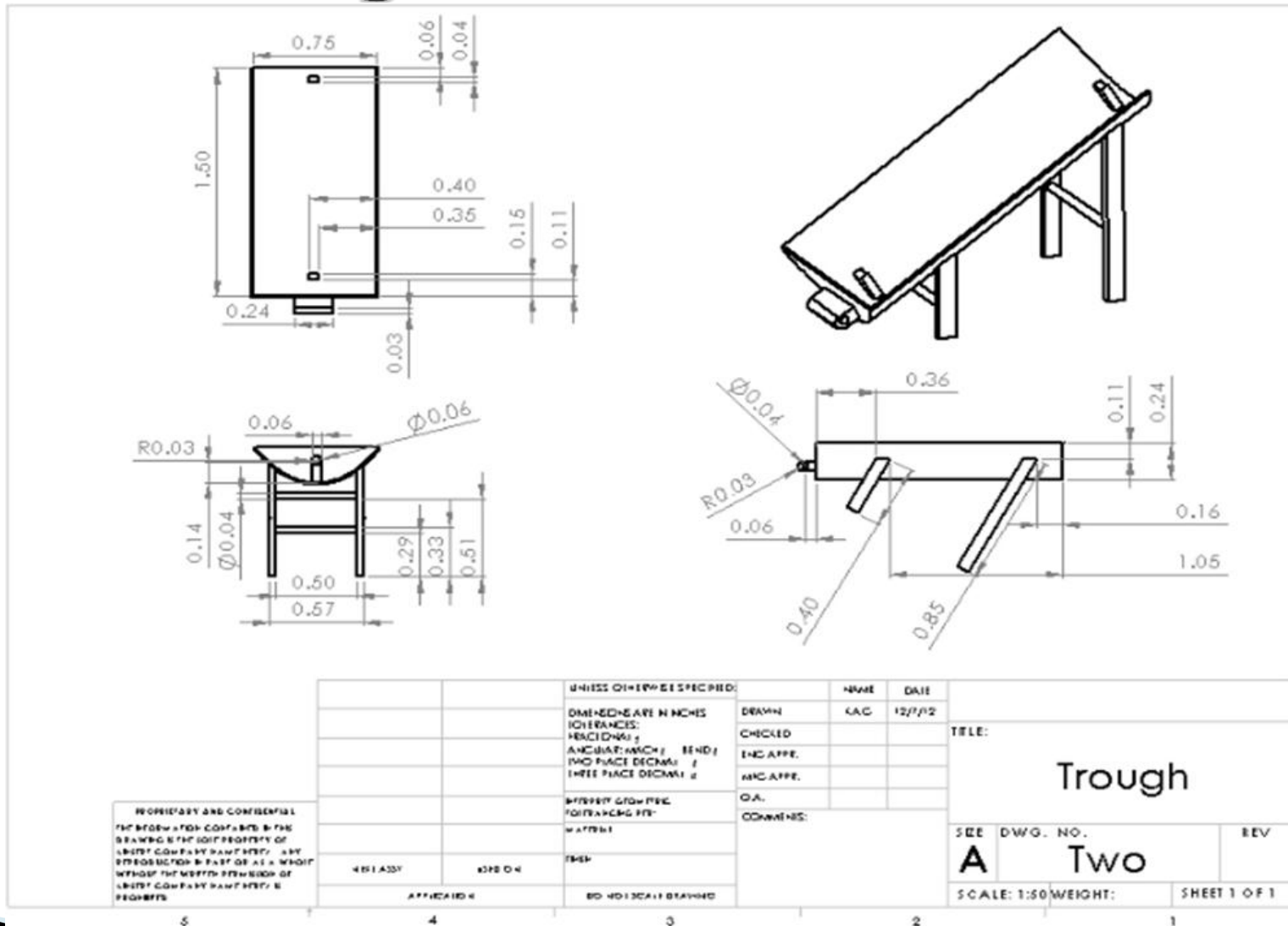


Figure 3: Dimensions for Trough

# Manufacturing of the Trough

- ▶ Parabolic shaped wood cut out
- ▶ Use sheet metal to shape trough
- ▶ Bolt sheet metal down to form to the wood
- ▶ Coat with Mylar
- ▶ Frame construction



Figure 4: Parabolic Trough

# Manufacturing of the Boiler

- ▶ Schedule 40 Galvanized Pipe
- ▶ Weld modifications
- ▶ Spring pressure construction and assembly

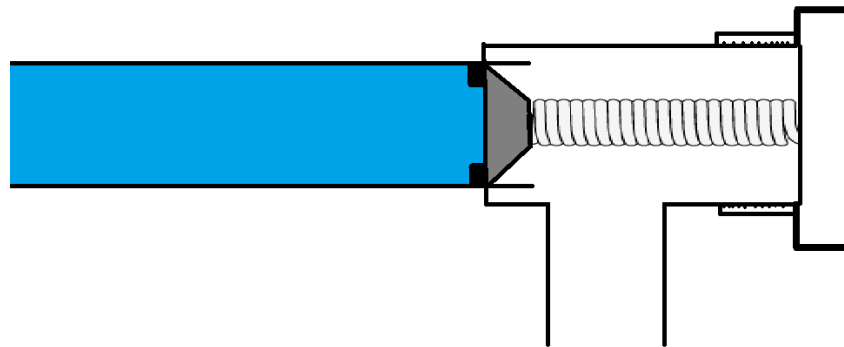


Figure 5: Spring pressure cap



# Manufacturing of the Pressure Vessel

- ▶ Drill for fittings
- ▶ Make “clamp” system
- ▶ Mount hose and valve fittings



Figure 6: Pressure Vessel

# User Interface Prototype

- ▶ Built from PVC/miscellaneous materials
- ▶ Purpose:
  - To observe how people operate the autoclave with a simple set of instructions
  - To prevent injury
  - Make necessary modifications to final design

# Gantt Chart

Spring 2013

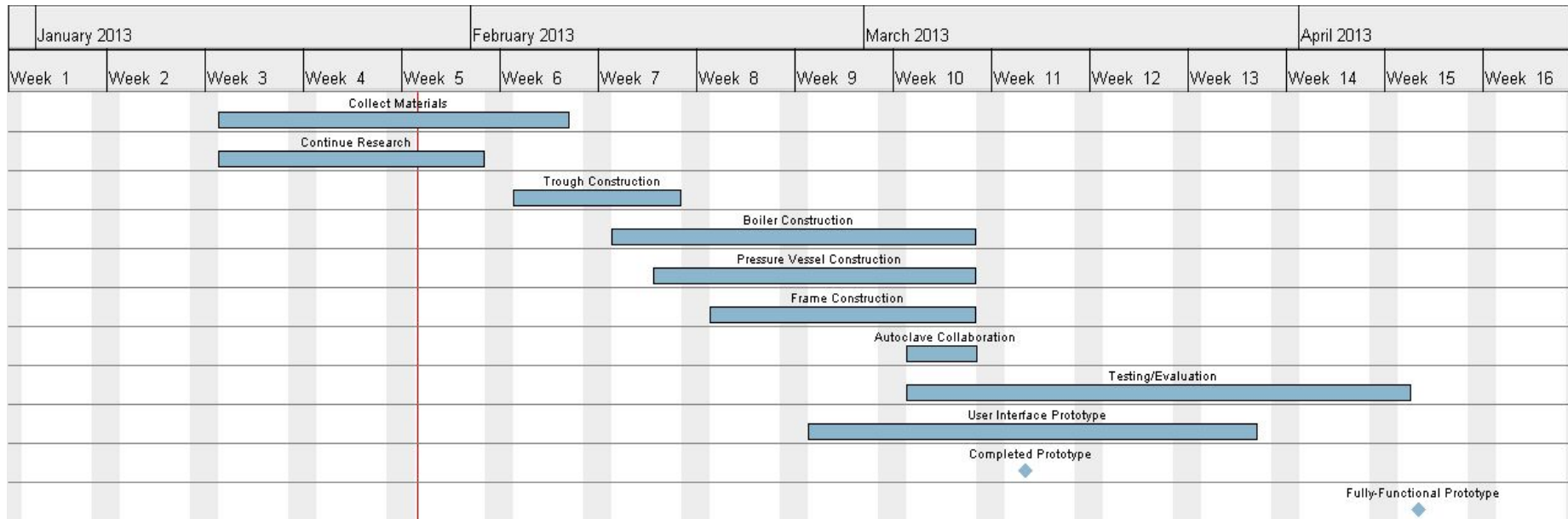


Figure 7: Gantt Chart

# References

▶ **Sponsor: Dr. Brent Nelson**

- [brent.nelson@nau.edu](mailto:brent.nelson@nau.edu)

▶ **Text:**

- Michael J. Moran and Howard N. Shapiro. Fundamentals of Engineering Thermodynamics 6th. 2008. Print.
- Richard Budynas and Keith Nisbett. Shingley's Mechanical Engineering Design 9<sup>th</sup>. 2010. Print.

▶ **Project Website:**

- <http://www.cefns.nau.edu/interdisciplinary/d4p/EGR486/ME/13-Projects/SolarAutoclave/>

▶ **Web Sources:**

- Centers for Disease Control and Prevention:
  - [http://www.cdc.gov/hicpac/Disinfection\\_Sterilization/13\\_0Sterilization.html](http://www.cdc.gov/hicpac/Disinfection_Sterilization/13_0Sterilization.html)
- Global Challenge:
  - <http://globalchallenge.mit.edu/teams/view/171>
- Solar Sterilisor:
  - <http://www.solare-bruecke.org/projekte-Dateien/Solarsterilisor/summary%20english.html>
- TravelState.gov:
  - <http://www.travel.state.gov/>
- Science Direct:
  - <http://www.sciencedirect.com/science/article/pii/S1364032110001206>

# Questions?