The Affordable Portable Filter Press

Overview
A ceramic filter made of clay, sawdust, and colloidal silver has been created to address the current need for clean water. Currently, the press that is used to create these filters weighs over 400 pounds and is approximately 8 feet tall. The team was tasked with redesigning the press so it would be lighter, portable, and able to be showcased all across the world.

Objectives
Redesign the filter press to meet domestic and international flight requirements.
- Redesign the press to weigh less than 50 pounds.
- Fit the redesigned press into a 62 linear-inch suitcase
- Redesign the press so it is easily assemblable and operable by a single person.
- Make the press durable so that it can withstand repeated use.

Approach
- The group held extensive discussions with Reservoir Studio sponsor, Dr. Carpenter, to get a list of requirements and specifications for the redesigned filter press.
- The group conducted a concept generation phase where all ideas were considered.
- The group voted on concepts created during concept generation; the ones that had the most votes were scored based on the Pugh chart created for customer needs.
- Analysis of existing products helped generate a variation of the A-frame design.
- Data was collected through a compressive test of the filter press using different jack strengths. It was determined that a minimum 2-ton jack was required for compressive strength.
- After choosing to proceed with the A-frame design, CAD models were created using SolidWorks.
- Finite element analysis was run through SolidWorks and the general design was constructed.
- A pre-pre alpha prototype was constructed of wood and small pieces of steel. The pre alpha prototype was created in a full steel version, which was re-worked to create the Alpha and beta.
- The filter press created clay filters during testing, and the resulting filters were then measured for thickness.
- Results were obtained using a pin to measure the thickness of the filter. This measurement was then averaged over the circumference of the filter.

Outcomes
- The combined weight of the filter press and the suitcase is 48 pounds, meaning that Dr. Carpenter will be able to travel anywhere in the world with it.
- The time required to create a ceramic filter using the filter press was greatly reduced.
- The press now only requires one operator instead of two.
- The press is easy to assemble, only requiring a few bolts to be tightened.