Baobab Processing Machine

Overview
The pulp of the baobab fruit is rich in nutritional value and has a high economic value for small villages once separate from the seeds. Unfortunately, to harvest and process this fruit is extremely time consuming and strenuous on the village women. For this reason, the need for a machine to process the fruit is in high demand. Since 2008, Penn State has been developing a machine to fill this need. In the past, it has been successful but needs further refinement before mass production. The machine is difficult to manufacture, assemble, and when done imprecisely, it runs inefficiently and is prone to jamming.

Objectives
The main objective for this project was redesigning the machine for manufacturing and assembly. The team focused on part reduction and simplification instead of overall system level redesign.

Approach
- Customer needs for the new design were obtained from the Coopérative Agricole Le Baobab in Benin where the current design is being used
- These customer needs were then weighted to prioritize the redesigns
- External searches on existing patents and products were done to generate ideas
- Concepts were then generated and with the help of our sponsor, the best designs were chosen
- CAD models were made for each of the redesigns until the whole machine was built within CAD
- Multiple engineering professors were consulted before beginning to manufacture the machine to gain feedback on the best plan to take
- A working prototype was built
- Multiple timed feed tests were performed to measure the efficiency and effectiveness of the machine
- New design processed baobab three times faster than the old design

Outcomes
- Assembly time was reduced by about four hours as a result of this project
- The number of welds was reduced from 25 to 3
- Perforated framing was used to eliminate the need for drilling holes
- Triangular frame with the motor mounted underneath was used to reduce the footprint and reduce the amount of material needed
- A single-piece of stainless steel was used for the cover and bent to the desired shape instead of welding two pieces together
- A removable mesh with latches was used instead of a permanent mesh to reduce disassembly/reassembly when the seeds get jammed
- The heart was made with a single piece of stainless steel
- Reduced to one output to increase simplicity (still have two products)
- Adjustable chain tensioning without a chain tensioner
- Round, direct-feed hopper provides more effective input
- Levelling feet for adjustable height and stability