Baobab Pulp Processing Project

Overview
When the Pennsylvania State University first began making the baobab machines, most parameters were arbitrarily chosen based on what was feasible and what resources and materials were available. Our team’s goal was to run studies and engineer a new baobab pulp-processing machine that will optimize cost, throughput, and quality of the mechanism.

Objectives
Our objective is to set values for the mesh clearance, heart length, number of grooves, depth of grooves, angle, and rpm of the machine so that the output of the machine best meets customer needs. Furthermore, our team was asked to improve the efficiency of the heart manufacturing process so that cost and time could be greatly reduced.

Approach
- A customer needs assessment was taken to determine the optimal response of the machine
- An external search was conducted to determine whether there were existing machines developed that could meet customer needs
- Engineering targets and metrics were developed to quantify customer needs
- Materials were selected based on previous designs
- Design of Experiments (DOE) was chosen in our concept selection as a statistical optimization tool for improving our product
- SolidWorks were created that changed the original version of the machine into a “dynamic” machine that could easily vary between different parameters
- The heart manufacturing process was automated via a CNC machine to reduce time. This process was then documented
- The dynamic machine was manufactured in the learning factory
- A testing plan was devised in order to minimize experimental time
- 16 different tests were conducted on the machine, and the results were entered into the DOE
- The DOE statistically analysed tests and determined the most optimal parameters to meet customer needs

Outcomes

- **Cost**
  - Decreased by $393.93

- **Throughput**
  - Decreased by 4.5 sec. for 1 kg.

- **Quality**
  - Increased by 0.93 usable cups