Detailed Task List

Julie Silva and Stephen Yoon

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Current Models

Past teams have worked on models with MathCad to determine the inefficiencies of mixing with a simple stick. In order to compare our improved mixer to mixing with a simple stick, we will need an accurate model.

1. Analyze the past MathCad model and check for any over-simplifications to ensure an accurate model for further comparison.
2. Follow the experimental procedure as done in the past, using the curent prototype and sugar at 200g/L with red dye to fully understand the current model.

Time frame: 1 week

Hydrometer

In order to assess our final prototype, we will need a way to accurately measure the final concentrations of the liquid. These measurements will be taken with a hydrometer.

1. Determine the required sensitivity of the hydrometer that will show a definite difference between mixing via a simple stirrer and mixing with the improved stock tank mixer design.
2. Research best, most durable, and cost-efficient designs for the hydrometer and most viable sources, whether it be fabricating one or purchasing one on the market.
3. Optimize design for simplicity and efficiency of use by plant operators in Honduras.
4. Test selected hydrometer for unmixed and mixed stock tanks solutions. Calibrate concentration of sugar with relative density. Use measurements to ensure that the mixer design is able to produce consistent results within an extended time frame.

Time frame: 2 weeks

Stock Tank Mixer Design

Previous work has been done to increase the vertical component of mixing by raising the denser solution from the bottom of the tank to the top by centrifugal motion. We plan to continue with this work and improve efficiency.

1. Analyze the current prototype through research and experimentation.
2. Research and test possible improvements to the current model by eliminating unnecessary head losses.
3. Research materials to fabricate a transparent centrifugal pump for better visibility and analysis.
4. Evaluate effectiveness of new model by comparing to previous prototypes and the simple stirrer through experimentation and modeling.
5. Ensure that the system can be scaled up and installed in a 55 gallon drum.
6. Develop a target concentration value range so workers in the Honduran plants know the centrifugal pump is working. This value will have to be reported in the log book for quality assurance.

Time frame: 6 weeks

Stock Tank Mixer Stability

The stock tank mixer will need to be held level for maximum performance. We will need to devise a method to do so. It will also need to be very user-friendly.

1. Brainstorm possible methods to keep the stock tank mixer stable. Analyze and test the best methods to choose our design.
2. Design a system to hold bottom of the pump centered in the tank. Part names are as shown below.

   (a)

3. Devise a better joint between the suction rod and the rotation rod to minimize unnecessary head losses.
4. Build a handle or other turning mechanism for operator use.
5. Build an prototype and test for efficiency and user-friendliness.

Time frame: 2 weeks

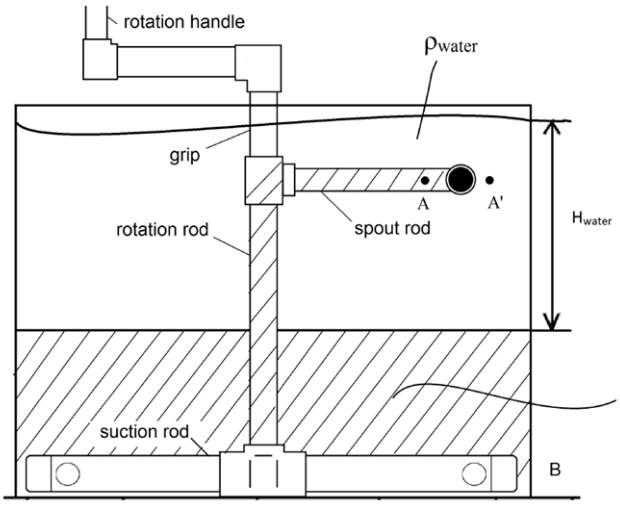

Figure 1: Centrifugal Pump with Labels

Impellers and Baffles

Baffles to minimize solid body rotation of the fluid. A significant amount of time will be needed to adequately analyze impellers to use on our design. If we do have time this is an avenue we would like to pursue.

1. Research and test possible improvements to the current model due to impellers and a potential way to provide energy.
2. Design a new system that incorporates these impellers.
3. Reduce solid body rotation by installing baffles into the stock tank mixer design.
4. Evaluate effectiveness of new model by comparing to previous prototypes and the simple stirrer through experimentation and modeling.
5. Ensure that the revamped system with impellers can be scaled up and installed in a 55 gallon drum.