

Ram Pump–Detailed Task List

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Part I

Pump Characterization

Our goal for this phase is to design, build, and test a working ram pump in the Tower of Power. The pump will be designed for data collection and ease of testing design alternatives. [Completed by April 6]

1 Design Pump

We will first characterize the essential testing parameters. From these parameters, we will then generate the design for a modular pump that will allow us to evaluate different design alternatives. [Submitted by February 16]

1. Theoretical calculations/parameter relations
 - (a) Pipe diameter
 - (b) Pressure line diameter
 - (c) Cycle time
 - (d) Flow rate (intake, outflow)
 - (e) Max elevation lift
 - (f) Head loss
2. Design “waste” water collection system
3. Develop schematic/plans
4. Generate materials list

2 Design Test Apparatus

We will design a testing apparatus that will enable us to test the pump in a variety of scenarios. The apparatus will connect our pump to the Tower of Power and return the “wasted” water back to the lower tank via the LFOM. [Submitted by February 16]

1. Generate list of test parameters
 - (a) Swapping valves
 - (b) Swapping air chambers
 - (c) Adjust length drive pipe
 - (d) Adjust inlet height
 - (e) Adjust flow
 - (f) Swapping high pressure pipes
2. Design “waste” water return
3. Sensor placement & set-up
4. Generate Schematic/Plans
5. Generate Materials List [Submitted by February 17]

3 Construction

We will build our pump and testing apparatus. [Completed by March 8]

1. Build test apparatus
2. Build pump
3. Initial evaluation of construction techniques

4 Pump Testing

We will test our pump by varying the parameters to collect data regarding the performance of the pump. From this data we hope to better characterize the pump to understand what factors impact performance and how they do so. [4 parameters tested by March 30]

1. Varying parameters to maximize flow out (each parameter will require a separate experimental design)
 - (a) Drive pipe length
 - (b) Valve size and type

- (c) Air chamber volume
 - (d) Inlet elevation drop
 - (e) High pressure pipe
 - (f) Drive flow rate
2. Collect data
 3. Evaluate data

Part II

Pump Optimization

Using the data collected from the modular experiments and our accumulated wisdom from building the pump, we will refine our pump design and construction for implementation in an AguaClara plant.

1. Construction techniques
2. Cost analysis
3. Finalized pump design

Part III

Suggestions for Future Work

Given extra time in the semester, we will explore other design options and aspects related to plant integration.

1. Swing valve
2. Stock tank delivery system