

Ram Pump

August 16, 2012

Abstract

The ram pump team will investigate the use of a ram pump that would be installed on the treated water line between the AguaClara plant effluent and the distribution storage tank. The ram pump would use a little of the excess elevation difference between those two locations to pump a small flow of water for use in the facility bathroom and to fill chemical stock tanks.

- skills: fabrication, strong in fluid mechanics

1 Introduction

The goals for the ram pump team are to simplify the design, make it more efficient, and create a pump that has high reliability and easy repair and operation. The team can build on the success of the Spring 2012 team. The team should prepare to demonstrate the ram pump technology at an AguaClara plant during the January engineering in context trip to Honduras.

2 Tasks

- Develop a better test stand to eliminate shaking and gain a more realistic estimate of efficiency of pump design. The current design loses most of the pumping energy to shaking the stand.
- Rearrange the valve layout so that high pressure line is at the bottom of the pump and the wasting valve tees into the drive pipe.
- Test a smaller air chamber (base this air chamber on the predicted pump volume per cycle and the compressibility of air). Calculate a required air volume that will keep pressure fluctuations small enough so that the flow of pumped water varies by less than some target factor (max flow rate over min flow rate). Evaluate the effect of this target factor on pump efficiency and set that target to a reasonable value.

- Replace the air chamber with a surge pipe. The surge pipe is a vertical pipe that is open to the atmosphere and that extends above the hydraulic grade line. The water level in the surge pipe varies during pumping.
- Choose either the air chamber or the surge pipe for subsequent testing.
- Figure out how to measure flow rates on the test rig using better design for LFOMs or some alternate method. Pressure sensors do not work well on the Ram pump system because of the huge pressure fluctuations.
- Design the connection to delivery line between plant and distribution tank
- Estimate delivery flow rates to stock tanks or storage tank.
- Determine if a storage tank for pumped water is needed.
- Figure out how to scale the pump design to higher or lower flow rates