

ptf23

Patrick Farnham's Individual Contribution Page

Spring 2011 Contributions

Along with my teammates Michael Liu, Weiling Xu, and Dominick Amador, I conducted research toward the development of an efficient, inexpensive water pump used to lift water from the Aguaclara sedimentation tank to the chemical stock tank.

Along with my team, I looked into two pump designs available in Honduras, the EMAS Flexi Hand Pump and the traditional rope pump. When neither looked feasible for use with Aguaclara due to performance and space constraints, we analyzed three basic pump designs in order to see if we could construct them on-site in Honduras.

Our lever-powered piston pump and foot-driven treadle pump looked feasible when analyzed in Mathcad, but our piston seal was found to be inadequate in testing which seemed to render these pumps inadequate.

Our diaphragm pump was much more promising, achieving a flow rate of 0.88 L/s during testing and requiring the least expensive combination of materials.

Fall 2011 Contributions

This semester, I conducted research toward the problem of Residuals Management in AguaClara plants.

There are numerous waste streams associated with the operation of our plants, including alum sludge (from the sedimentation, flocculation, and entrance tanks), dirty backwash water, plant influent/effluent during bypass and treatment failure, chemical precipitates from preparation of our chlorine disinfection solution, and chemical waste from the alum and/or PAC stock tanks.

I researched different dewatering and treatment methods to handle the alum sludge, including lagooning, irrigation, and simple dispersal. There were too many issues associated with dewatering and treatment processes, most notably due to the lack of a freeze/thaw cycle in Honduras as well as our desire not to create standing bodies of water in which disease-spreading mosquitoes could reproduce.

I proposed that the most feasible option for residuals management is to continue diluting and discharging our waste streams, but to begin protecting the land at the outlet of our disposal pipes. This can be done with rock-lined pipe outlet protection structures, design procedures for which have been programmed into Mathcad.