ag936

Apoorv Gupta's Individual Contribution Page

Stock Tank Mixing Team

Spring 2014 Contributions

Stock Tank Mixing goals for this semester focused on re-designing the stock tank mixing system completely to achieve goal density efficiently. Three different designs were tested and all of them gave perfect results. A plate mixer and water injection system were developed and were found to be optimal out of the three designs. A combination of these two designs was highly effective in properly making and mixing stock solutions and have been provided to the team in Honduras for implementation. .

Pipeline Cooling goals included analyzing the heat transferred to influent water via raw water pipelines and researching possible solutions. One of the possible solutions was to use cool roof coating. We researched and found two products that would prove to be effective, but they are very expensive. The reason these products will not be used is that more research is required to actually understand the effect of temperature gradient on the sedimentation tank performance. Redesigning the plate settlers to be able to handle water circulation due to the warm influent water is also a possibility.

Fall 2013 Contributions

This semester I will be working with Stock Tank Mixing Team. I am supposed to invest my time in finding an appropriate hydrometer that can measure the concentration of the stock and can easily be transported to Honduras. I am also supposed to work on the stock tank centrifugal pump which will ensure that the plant operator can prepare a homogeneous solution in the stock tank.

Hydrometer

We have concluded Krackeler Scientific Polycarbonate Hydrometer with range 1.000-1.220 to be the most appropriate equipment to measure the PACl solution concentration in an AguaClara plant. We have purchased three of them to be sent to Honduras with the students in January 2014. The conclusion was reached at after performing several tests using Honduran PACl to determine the relationship between the concentration and density. This relationship helps convert the specific gravity reading from the hydrometer to its corresponding density value. The relationship is: *Density PACl = 0.492*(Hydrometer Reading) + Density of Water*.

For the chlorine solution the specific gravity range is quite small, which requires a very precise hydrometer. At the same time, durability is still the biggest deciding factor and no polycarbonate hydrometer with the desired range (1.012 being the max) is available. For the testing purposes during spring 2014, we have purchased a Cole Parmer (1.000-1.050) glass hydrometer to conclude if we should invest our time in getting a polycarbonate hydrometer of desired range manufactured.

Stock Tank Centrifugal Pump

We used the design from last year's coagulant management team and improved it. It involved replacing the brass joint at the bottom with 1/2" PVC plate that sits at the bottom of the tank. A PVC t-joint is connected to the plate using two stainless steel screws, this provides the stability to the base of the pump which was a challenge faced by the coagulant management team. We used a wooden piece that fits at the top of the tank through which the pump passes; this makes the pump totally stable. We used sugar solutions of various concentrations and used red dye to distinguish from less dense water to perform the pumping tests. After the several tests, we have concluded that the current design is extremely inefficient because of the major loss of input power due to the drag caused on the rotating arm. For next semester the team will work on fabricating a streamline arm to reduce the drag coefficient. We will also invest some time in exploring new ideas that can be used to make an efficient centrifugal pump.