rg382

Roy Guarecuco's Individual Contribution Page

Fall 2010 Contributions

During the Fall 2010 semester I continued to work with the ANC Control team. Specifically, I worked on the new effluent recycle system designed for the current ANC Control lime feeder model. The effluent recycle system was designed to carry a fraction of the lime feeder effluent back to a precipitation reactor seeded with calcium carbonate to remove carbonates from the lime feeder influent before it reached the main reactor. This design was expected to keep the main reactor effluent basic enough to add sufficient alkalinity for further chemical dosing with alum. The goal was for the lime feeder effluent to maintain a pH of ~12 for at least 24 hours, so that a plant operator would only have to add the lime solution to the main reactor once a day. This pH would theoretically drop to the optimal 6.5 to 7.5 pH range required for flocculation after being dosed with alum. However, after learning that research in Honduras discovered that the use of a new coagulant, poly-aluminum chloride instead of alum, kept the pH of the chemical dose controller effluent between the optimal 6.5 to 7.5 pH range required for flocculation, the lime feeder research was stopped.
After the lime feeder research was stopped, I joined the Chemical Dose Controller team along with the rest of the ANC team and worked on redesigning and constructing the nonlinear CDC prototype with the focus of minimizing the cost and number of parts so as to make the CDC more operator-friendly.

Spring 2011 Contributions

This semester I have worked on a new Invent team, the Turbidimeter team. I worked on the design of a simple, inexpensive, reliable way of measuring the turbidity of a water sample. The design involves filling a meter-length tube of 2 in. diameter with a volume of water that is to be tested for approximate turbidity. An LED light attached to a lowering component of slightly longer length than the tube itself is then lowered into the volume of turbid water. Using a power law relationship that correlates the turbidity of the water sample to the depth at which a pattern on the LED light becomes indistinguishable, an approximate turbidity measurement can be made.
I worked on the experimental design used to obtain the power law relationship associated with the use of different LED visual patterns as well as different LED light bulb battery powers. Experiments have involved keeping a constant volume of water in the turbidimeter tube and incrementally adding a mass of kaolin clay to the water to obtain steady increases in turbidity. LED depth and turbidity measurements are made after each addition of clay and a plot of LED Depth (cm) vs. Turbidity (NTU) is constructed for each data set. Regression analysis is then used to fit a power law curve to the data points. The R^2 value of each data fit helps us decide which LED visual pattern and battery power will allow the most reliable and accurate power law relationship between LED depth and water turbidity. This will lead us to standardizing the components of our turbidimeter to include a turbidity scale on the LED lowering component itself, allowing any operator to easily read off the turbidity of a water sample at the water surface level of the turbidimeter tube.