Chemical Dose Controller

Task List, Spring 2014

April 7, 2014

Team Coordinator: Saugat Ghimire Responsible for facilitating team meetings and keeping track of progress over the course of the semester to ensure that goals are completed in a timely manner. Serves as communicator between the team and Dr. Weber-Shirk and Casey Garland.

Materials Coordinator: Annie Cashon Responsible for ordering materials, as well as keeping track of and organizing materials previously ordered for the team.

Data Coordinator: Jeanette Liu Responsible for ensuring that the data from experiments is saved in an appropriate place on the server and with an appropriate name.

Report Proofreader Responsible for proofreading the report and making sure there are no errors. We will alternate weekly for this responsibility.

February 14

1. Order the full size single arm CDC and test it in the lab. Incorporate this design into the full size ‘ double arm CDC. Determine if the half size doser is appropriate for chlorine dosing and if so, design a single lever, half size doser system for village level chlorinators. If the half size doser is not appropriate, then design a single lever, full size doser. Design the single lever system to use the same lever as the double lever system. Test and evaluate the single lever system for ease of use and check its accuracy.

   (a) Complete the sketch-up file. Get it approved by Monroe. Send it to Hancock Precision for Fabrication.

2. Design a better experimental test rig that keeps the dosing tubes straight and tight.

   (a) Sketch potential set-ups and assess if they are appropriate.

March 27

1. Develop a method to remove air from the dosing tubes easily. Determine if an easy method for removing air can be created for the 1/16" tubes. If it turns out that it is much easier to remove the air from the 1/8" tubes, then consider whether 1/16" tubes are a viable option.
2. Demonstrate the ability to swap components quickly and easily to adjust flow rate.

April 11

1. Figure out the flow break points in the design that result in selection of different tubing sizes or different number of tubes.
2. Locate tubing connectors that are chlorine resistant from constant head tank to rapid mix.
3. Assemble and test all the components for chemical dosers of different flow rates.
4. Design, build, and test a simple height adjustment system for horizontal axis CHT (not using 80-20).

    (a) Test out a height adjustment set-up with turnbuckle and chains. Brainstorm ways to make this system more user friendly, discuss possibilities with Monroe and Casey and finalize the set-up.

April 18

1. Determine the flow range for the mini float valve and then design for higher flow rates using a larger float valve.

2. Work with Kerick or the CEE shop to develop a float valve that doesn't have any metal components. The cotter pin and bolt are both susceptible to corrosion and eventually fail when used in chlorine.

   (a) Call Kerick and discuss possible existing floats that fit into our design requirements. Simultaneously talk with Paul to assess cost of making them in CEE lab. Weigh both options, discuss with teammates and Monroe and finalize an option. Take necessary steps for fabrication. Purchase and test several different CHT for ease of use. Verify or assess the compatibility with chlorine (especially the cap). Use the mini float valves from Kerick Valve and use the standard float provided with the valve.

3. Test units at stock concentrations used at AguaClara facilities.

4. Explore better (lighter, easier to ship, less expensive) options rather than PVC pipe for the float that moves the doser lever. The parameter that matters for the accuracy of the doser is the horizontal projected area of the float where it pierces the water surface. The volume and mass of the float are NOT important parameters except to ensure that the float is stable. The float could even have a density greater than water given that the other end of the lever has a counterweight. Options include buoys, flat 1-2 cm thick disk of non porous concrete, PVC disk (http://www.mcmaster.com/#8745k487/=o1twlh) or plate (http://www.mcmaster.com/#8747k107/ The PVC disk could be perfect if we can find an easy way to cut the 6" diameter PVC rod into approximately 2 cm long disks. The PVC plate could be perfect if the square fits in the entrance tanks and if the weight is sufficient to match the counterweight. It might be necessary to add a weight hanging on the bottom of the plate or hanging on the cable on top of the plate.

   (a) We don't want to look into having a counter weight so we will discuss this with Monroe. After we meet, we will start looking for light and cheap materials in McMaster-Carr or US Plastics.

April 25

1. Assess if calibration columns on the drop tube are a good idea or not. If drop tube calibration columns are better than calibration columns next to the stock tanks, then integrate calibration columns into the drop tube. Determine what chemical flow rates are compatible with a drop tube calibration column. Print transparent labels for the calibration column and devise a method to make the designs for the calibration column available on our website. We need a smaller diameter drop tube and valve to reduce the weight on the lever arm.

2. We need a plan for shipping CDC systems. This should be coordinated with AguaClara LLC. This would include having an idea of what "pre-assembly" would look like on our side in addition to modifying the instruction manual to reflect the changes in the system.

3. Demonstrate that the calibration procedure is easy. This could be assessed by getting students from other teams to try and assemble the system with the instructions.