LFSRSF Team Detailed Task List

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1 Outline of tasks for Summer 2014

The following tasks will be split into sub-teams of two/three members.

1.1 Change the Inlet/Outlet Tank Configuration (June 14th, 2014)

- Increase the height of the exit tank so that there is no air in the filter column, using the gasket and hose clamp arrangement.

1.2 Find out the Head Loss through the slots on slotted pipes (June 18th, 2014)

- Set up a two-tank arrangement with a slotted pipe in one of the tanks. Use pressure sensors to measure changes in height in the tanks as one tank empties and the other fills up, thus measuring head loss through the slots.
- Include a layer of sand to see the effect of slot area covered with sand.

1.3 Find out the plumbing head loss in the filter (June 18th, 2014)

- Analytically find the expected head loss, using MathCAD and fluids functions.
- Compare to head loss found in the filter (Subtracting slot head loss from total plumbing head loss found using the sand drain manometer).

1.4 Determine what must be changed to reduce the head loss during backwash and filtration; replace/upgrade that component (June 25th, 2014)

- Depends on the answers to Sections 1.2 and 1.3. Might require to change slotted pipes, or trunks. If fabrication is involved, this might take some time, pushing back the dates noted for other tasks.

1.5 Test the sand drain and look for improvements (June 20th, 2014)

- If during 1.4 the filter needs to be drained that would be an automatic test. Else test the drain to remove all the sand out of the filter. While refilling the filter, be careful that the column is filled with water before pouring sand into it slowly (to prevent air pockets forming in the sand).

1.6 Update LFSRSF Design Code (July 2nd, 2014)

- Update the code for plumbing using flexible tubing and no valves.
- Include autocad drawings from May's code and update them for the current system.
- Create a modular LFSRSF design code for the new system, using the updated version of LFSRSF ADT code and versions of May's design code.

1.7 Evaluate Flow Distribution between Sand Layers using Pressure Sensors (July 2nd, 2014)

- LabVIEW is already set up, require data collection and analysis.

1.8 Evaluate the option of adding flow restrictions on the inlet pipe stubs (July 2nd, 2014)

- Use a cap with an orifice of the required diameter drilled into it. Consider the option of putting the cap on a pipe stub so that the operator can reach the cap easily (i.e., remove the entire stub during backwash).

1.9 Design a control system for flow distribution between multiple LFSRSFs (July 9th, 2014)

- In systems with more than one LFSRSF, we require a control system to ensure that a backwashing filter receives its design flow. We could use a double-pipe stub system with an orifice to ensure this. Work on the general design, and create design code for this system.

1.10 Develop a method to fabricate inlet and outlet tanks including the weir system (July 16th, 2014)

- Fabricate the system designed in Section 1.9. This might need an entrance tank of a larger diameter, requiring re-fabricating the current tank.

1.11 Figure out a method that enables the operator to know if the sand is fluidized (July 20th, 2014)

1.12 Filter performance testing; and measuring the head loss required to fluidize the bed for clean and clogged bed conditions (July 30th, 2014)

- Measure the head loss required to fluidize a clean bed.Also?
- Set up stock tanks for clay and coagulant (PACl), plumbing and process control. (Begin planning for this task after completing task 1.4 as it might require ordering pipes/joints etc.)
- Run the filter till failure (clogging). Measure the pC* of the filter achieved. possibly run multiple runs.
- Once the filter has been clogged, attempt to fluidize the bed and backwash. Measure the required head loss.
- (Also?) use the 2 layer at a time system to determine the head.

1.13 Ability to cycle between filtration and backwash (July 30th, 2014)

- Set the pipe stub heights as low as possible for reliable operation
- Lower the inlet and outlet tanks as much as possible to improve operator access