Sedimentation Tank Hydraulics: Detailed Task List Spring 2013

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Objective 1 - February 4-20: General Set-up

- Consolidate the experimental setup and move entire apparatus to the left side of the sink.
- Lengthen the flocculator and re-build it in a vertical format so it can be placed behind the light panel.
- Clean out existing material in the flocculator using chlorine.
- Create a PVC insert to replace the foam inserts.
- Switch to using PACl and determine how the dosage compares to using the alum. See Atima online performance data to obtain an estimate of the required PACl dose.
- Implement external function in Process Controller to measure sludge height and control sludge pump (i.e. remove sludge from floc hopper when it reaches a maximum height).
  - Makes it possible to measure the flow rate and indirectly the concentration of the resulting sludge.
- Record all future tests with details of experimental set-up including coagulant dosage, raw water turbidity, presence or absence of plate settlers, and ratio of the real time to the time of the videos.

Objective 2 - February 21-25: Background Research

- Read Matt Hurst's published and in-process papers on floc blankets.

Objective 3 - February 27-March 13: Test for optimal upflow velocity

- Use the 10% Plan View Area weir and test it at three different upflow velocities, varying by 0.2 mm/s above and below the 1 mm/s current upflow velocity.
- Decide the optimal velocity based on the effluent turbidity, lower effluent turbidity is desired.

Set	Description	coagulant dose (mg/L)	upflow velocity (mm/s)	Floc ho
1	coagulant dose	5-15 in steps of 5	1mm/s	
2	upflow velocity	low dose that was effective	.8-1.2 in steps of 0.2	
3	floc hopper depth	coagulant dose that was effective	upflow velocity that was effective	0.4-0.6
4	time until formation	coagulant dose that was effective	upflow velocity that was effective	opt

Objective 4 - March 14-April 5: Test for influence of floc hopper depth on sludge consolidation

- Keeping the location of the top of the floc hopper constant and using the optimal upflow velocity found in Objective 2, change the floc hopper size to test the effect on sludge consolidation and effluent turbidity.
  - Make sure to change the pump speed for different floc hopper depths to maintain constant velocity.
  - Find the optimal ratio between floc blanket area and floc hopper area to discharge lowest effluent turbidity and greatest sludge consolidation.
  - Discover the best way to test sludge consolidation (evaporation and massing, diluting the sludge and testing the turbidity, or direct optical imaging).

Objective 5 - April 8-19: Develop a relationship that gives the time until floc blanket formation

- Create a theoretical model based on mass conservation and then test this model at low, middle and high turbidity. Vary the influent turbidity. Work upward from 100 NTU to maximum turbidity in increments of 50 NTU, then work downward from 100 NTU, decreasing increments as turbidity decreases (i.e. decrease to 50 NTU, then 20 and/or 10 NTU depending on results). Record the time it takes to form a floc blanket to try to develop a relationship between turbidity and time until floc blanket formation.

Objective 6 - April 19-May 1: Research ways to facilitate operator management of floc blanket and floc hopper

- Conduct internet research to determine ways for the operator to manage the floc blanket and floc hopper. Evaluate the AguaClara proposal of sight tubes through one of the sedimentation tank channels into the floc hopper zone. Test this approach in the apparatus. Develop a method for assessing floc blanket depth from the top of the sedimentation tank.
  - See the Sludge Judge.
  - Another option would be to find the floc water interface using a submersible LED that is lowered through the sight tube into the sedimentation tank.