Floc Recycle Venturi: Detailed Task List

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Weeks 1-3: Venturi Research

- A venturi is essentially driven by the Bernoulli Equation (see 1). We need to determine the ratio of the cross sectional area of the rapid mix pipe to the cross sectional area of the contraction in the venturi that will create a low enough pressure to pull water from the floc hopper into the rapid mix pipe. Once we find this ratio, we will determine if it is mechanically feasible to install it in an AguaClara plant.

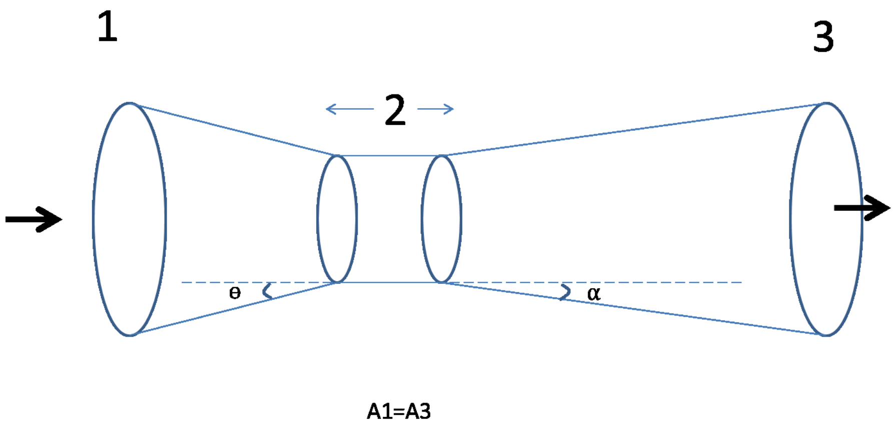

Figure 1: A depiction of a venturi

- The easiest way to determine its feasibility is to test it out on a real plant design. We will request a design from the design tool for a plant of reasonable flow (12 L/s) and use this design to determine relevant parameters. These will include the diameter of the rapid mix pipe, the distance from the floc hoppers to the rapid mix pipe, and the head loss through the flocculator and sedimentation tanks. We will also need to make assumptions about the turbidity of the water we are pulling from the floc hoppers, as well as the minimum turbidity that we are attempting to achieve with the

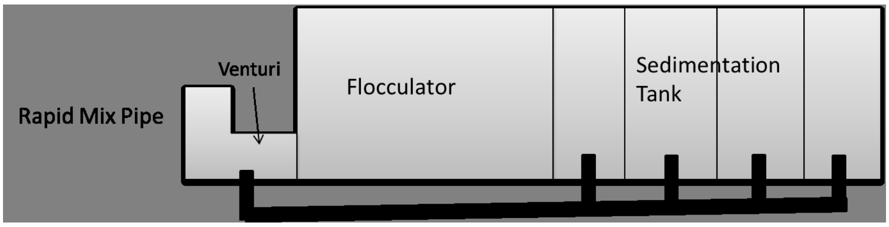

Figure 2: Diagram of proposed conveyance system that will transport flocs from sedimentation tank back to the flocculator

venturi (since another team is finding the optimum inflow turbidity). This will allow us to find the flow rate of recycled water necessary to add to low turbidity water.

- The low pressure zone created by the venturi will have to overcome the head loss through the flocculator and sedimentation tanks for it to take up the recycled floc water. Once we have the values calculated above, we can adjust the diameter of the contraction until the pressure difference is sufficient to over come this head loss. If the contraction is feasible (i.e. not too small to be constructable), we can look at how to scale the venturi to fit a range of rapid mix pipe sizes. We will also need to research the head loss through a venturi, as well as how to construct the angles to minimize this loss.

Week 5: Floc Recycle Venturi Construction and Conveyance System

- Once we know the area ratios and angles required for our venturis, we can explore different geometries (i.e. non-cylindrical contractions) and fabrication methods. Since only the cross-sectional area of the contraction should matter, the shape the pipe takes is irrelevant. We will decide which fabrication technique is easiest and test it.

- We will also determine the best way to consolidate recycled floc water from all of the floc hoppers and convey this to the venturi. At this point, we feel the best way to do this is to have a pipe coming out of each sedimentation bay, which all converge into a single conveyance pipe (see 2). While this is pretty straightforward, we need to brainstorm a good way to regulate the system. This conveyance system should be able to shut off and restart without causing issues in the plant. An easy way to do this is to install valves in the system, but if we can find a way to do it without valves it will save us money.

Weeks 6-14: Improvements Based On New, Incoming Research

- By this point, most of the venturi project will be complete. We will know how to construct them, and have a rough idea of how well they will work in a plant. However, we can optimize the way the venturi is implemented based on findings from the Floculation/Sedimentation Optimization team. As they gather more data, we will know more about the piping lengths, optimum turbidity of inflowing water, and head loss through the flocculator. We can then refine our programming to reflect these discoveries and more appropriately size the venturi.