Fall 2010 Inlet Manifold Team

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Hypothesis: Hypotheses regarding the design of the inlet manifold and the cause of irregular flow in the sedimentation tank.

Design and Models: Here, you can find sketches, pictures and links to the videos of experiments that we have done.

Experiments and Data Analysis: Several experimental methods have been employed to research the hypotheses described above. Data and analysis from these experiments can be found in this section.

Research of Potential Design Options: Since proving our two initial hypotheses, our team has done extensive research and experimentation to determine the best design recommendations for the AguaClara inlet manifold. This document outlines each design idea, shows models built and links to videos of experiments, and provides an evaluation.

Reflection Report #1: Two crude models were used to reveal that the horizontal component of the velocity out of the ports may be a key factor to solving the floating floc / uneven flow distribution problem. The team identified the initial challenges of the project and developed a detailed task list and schedule to move forward in researching the inlet manifold.

Reflection Report #2:Using a 1/12th scaled down PVC pipe model, the team discovered that the wall-thickness of the pipe was causing backwards flow out of the port. To overcome this obstacle, two new models were made using thin copper piping. These two models were used to perform an experiment of capturing the flow out of the 1st and 15th ports. Additionally, the team continued to modify the experimental set-up to create a flow rate that was both quiescent and large enough to produce the desired head loss.

Reflection Report #3: The team modified the experimental set-up so that experiments could be conducted on both a submerged pipe and a pipe suspended in the air. Flow collection and dye test experiments proved that horizontal velocity and pressure recovery were indeed significant problems in the current inlet manifold design. Hence, our team is now researching for ways to solve these problems.

Teach in On November 2nd, our team presented our Teach In to the Agua Clara class. Our presentation presented our original problem, pressure recovery, and introduced our new problem of horizontal flow. We discussed our revised hypotheses, our designs and models, and the experiments and results we have obtained thus far. Our presentation finished with a discussion of our future challenges and ideas for new designs for the Inlet Manifold to be implemented in future Agua Clara plants.

Reflection Report #4: Our team continued dye testing on two new models, testing the effects of baffles and tapered spacing on the manifold. The previous issues we experienced with our pressure sensor were resolved and we were able to collect data, measuring the pressure difference between the beginning and end of the manifold. We also used our apparatus as a monometer to visually measure the pressure differential.

Reflection Report #5: Our final reflection report high lights all of our work from the semester, but specifically focuses on a new model we built and our investigation into launders. We built a clear, PVC model and experimented with differently modeled jets that functions as baffles within the manifold. Our work also focused on determining the effects of launders and how necessary they are for future AguaClara plants. Finally, we also reconfirmed our predicted values for pressure recovery between the first and last ports using a "home made" monometer.