

Final Report

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Abstract

This report will cover the research that is currently being done in Cornell's AgauClara lab to create a fabrication method for the diffuser tubes on the inlet manifold. This team is needed develop method by which the diffusers can be easily manufactured in Honduras. Very little work has been done on this fabrication process as this is a new part of the AguaClara plant. This report will first discuss the need for the diffusers and how they help the plant be more efficient. The report will then summarize the research that is currently being done will be described, along with plans for future research.

Introduction

The Inlet Manifold is a part of the sedimentation tank. The diffuser tubes which this team will be fabricating extend from this inlet manifold, see figure1 . The tubes are necessary because they help to create a uniform flow between the manifold ports and they also create a line source which will divide between the two sides of the sedimentation tank and suspend all flocs heading toward the center of the tank. The most effective specifications for the design were determined in August 2011, and this is the design that will be fabricated for new plants beginning this fall. Suggestions for how the diffusers could be created include various ways of heating the PVC they will be made out of and then using a mold or a jack system to create the specified shape.

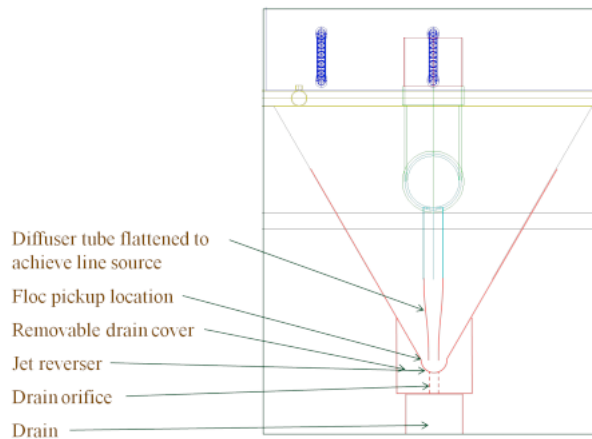


Figure 1: sketch of the inlet manifold with diffuser tubes

Background

In August of 2011, the ability of AguaClara plants to form floc blankets was improved and will be built in Atima, Santa Barbara, Honduras. The conceptual design for the new system has been created. However, a new method is needed to fabricate the inlet manifold system.¹ The preliminary design for the Atima, Santa Barbara plant calls for a 6 inch diameter manifold, 4.4 cm diameter ports every 12.1 cm, diffusers that are 3 inches in diameter and approximately 60 cm long. The diffuser pipes will be heated, reshaped, and stretched by 20% into a rectangle that is 3.2 cm wide and 12.1 cm long. The rectangular section should extend as long as possible so that there is a long distance for the fluid to approach uniform flow.²

Experimental Setup & Methods

An easy and cheap method needed to be created to fabricate the new inlet manifold. In order to do this, PVC pipe should be heated and then molded into a rectangle that is 3.2 cm wide and 12.1 cm long. After some research was done, it was determined that PVC pipe could be heated using boiling water, a heating blanket, or a heat gun. Boiling water is by far the cheapest method and easiest resource to come across. An initial test was done to see whether boiling water could heat the PVC pipe up to a high enough temperature that it could be molded.

1. Place water in a microwaveable container that the PVC pipe fits in
2. Put the container full of water into the microwave
3. Heat the water using the microwave until it starts to boil
4. Submerge the PVC pipe in the boiling water
5. While the PVC pipe is heating, repeat steps 1-4 with another container
6. Put the PVC pipe in the new boiling water container and reheat the old one
7. Keep switching containers with boiling water until the PVC pipe is very hot
8. Using protective gloves, stretch the PVC pipe to different dimension

Analysis

The method of using boiling water proved to be very successful in heating the PVC pipe up to a temperature that it is easily molded at. There was a bit of a problem in keeping the water hot because of the limited size of the microwave. A hot plate would be a lot more efficient because it would keep the water at a constant boiling temperature so the PVC pipe can be heated a lot quicker and kept at the hotter temperature.

Conclusion

Using boiling water to heat PVC pipe is a very easy and cost effective way to mold the PVC pipe to different dimensions. This method will be used in the rest of the experiment to see if the PVC pipe can be stretched to the dimensions listed above.

Future Work

A wooden mold is being created to jam the hot PVC pipe onto so that it stretches to the dimensions at the end of the mold (See figure 2). The mold is made of wood so that it can withstand high temperatures and water that it will come into contact to when the PVC pipe is placed onto it. Once we test the wooden mold, we can then determine if the PVC pipe meets the standards needed to be an inlet manifold.

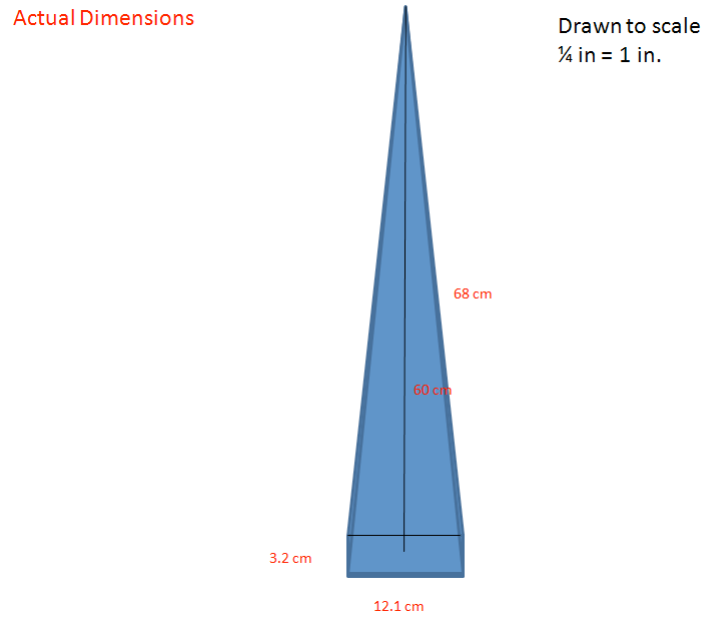


Figure 2: mold design

References

1. Floc Blanket Research