

Floc Recycle Venturi

January 11, 2012

Abstract

Floc recycle from the floc blanket to the flocculator will likely improve plant performance and reduce the required residence time in the flocculator. If floc recycle proves to be effective then a method to pump flocs from the floc blanket to the flocculator will be needed. It should be possible to use a venturi in the rapid mix pipe to generate a low pressure zone has a lower piezometric head than the floc blanket in the sedimentation tank. The challenge will be to fabricate an efficient venturi that can be installed in the rapid mix pipe. It will also be necessary to devise a hydraulic method to combine flocs from all of the sedimentation tanks.

Students 2

Skills Fluid Mechanics and Fabrication

1 Introduction

A venturi is a flow contraction followed by a gradual flow expansion. Bernoulli's law applies into the throat of the contraction and thus the piezometric head is low in the contraction. It is relatively easy to generate piezometric head that will be depressed sufficiently to pump flocs from the floc blanket. The expansion section of the venturi must be sufficiently gradual so that most of the kinetic energy is converted back into a higher pressure. This pressure recovery is critical so that the low piezometric head in the throat of the venturi is lower than the downstream piezometric head.

Venturis normally require complicated machining to make the two tapered sections corresponding to the contraction and the expansion. The challenge is to develop a method to fabricate a venturi that does not require sophisticated machining. One possibility is to deform a section of PVC pipe. An axis symmetric venturi would be difficult to produce. A two dimensional contraction formed by turning the pipe into a narrow slot might be easier (see the Fall 2011 Inlet Manifold Diffuser Final Report for a great fabrication method for this). There undoubtedly are many other fabrication methods. Test several fabrication methods both for ease of fabrication and for efficiency. Use the hydraulic test station in the project lab to measure total energy loss through the venturi as well as pumping capability.