AguaClara

Fabrication Fall 2014

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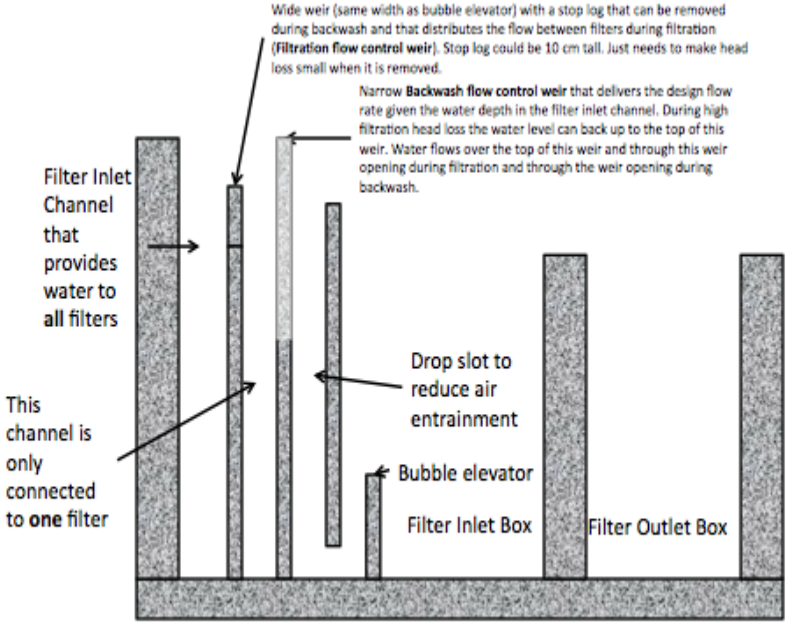
SRSF Weir System

Goal:

Make a hydraulic working scale model of the SRSF weir system for two filters to demonstrate how the weir system is used to set the flow to the filter during backwash. The hydraulics of this system are sufficiently complicated that explaining how it works is difficult and thus we need a working model for demonstration.

SRSF Weir System



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SRSF Weir System

Major Design Components

- Weir Box/Tank
  - Maintains Hydraulic Similarity
  - Reasonable Size (portable)
- Removable Weirs
  - Maintains Hydraulic Similarity
  - Easy to remove
- Outflow system
  - Easily change between backwash and filtration flow rate
  - change in water depth (standpipes)
- Inflow system
  - recycles flow back into weir box
  - constant design flow rate

Weir Box

- Scaled from 50L/s agua clara plant CAD drawing
- What is a reasonable scale
  - ⅕? ⅛?
  - Need to use Dimensionless analysis to match length scale to flow rate
  - Froude Number
- Break CAD drawing into individual components
  - determine assemblage
  - determine wall thickness

Froude Number

- Froude number is ratio between inertial forces to the weight of an element
- Determines Hydraulic similarity, flow through model (.28 L/s)

$$Fr=V/sqrt(g*L)$$

$$Fr=Q/(L^2*sqrt(g*L))$$

$$Fr=Q/(L^5/2*sqrt(g))$$

$$Q.model=Q.plant*L^5/2$$

Outflow/Siphon System

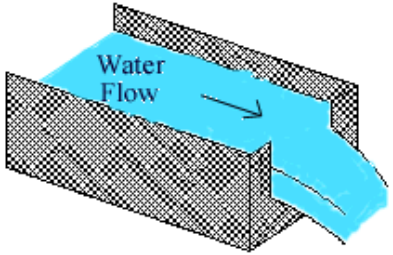
- Needs to achieve backwash flow rate
  - 0.28 L/s * 0.8= 0.224 L/s
  - Determined by pipe diameter
- How to Mimic Siphon for backwash
  - Gate valves

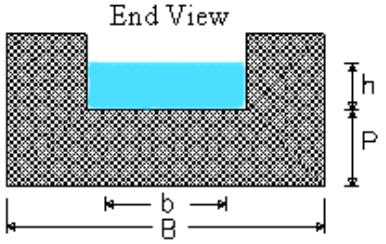
Weirs

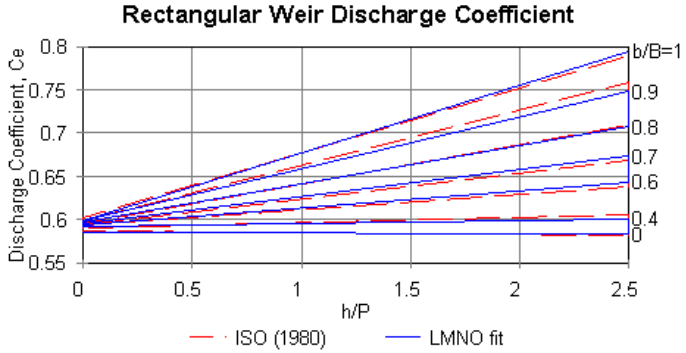
- Do the Weirs maintain hydraulic similarity?
  - YES!

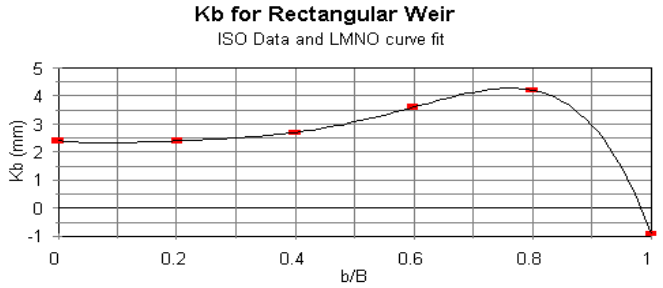
Rectangular Weir Equation:

$$Q=Ce*2/3*2*g*(b+Kb)*(h+Kh)3$$









Future Work

- Continue testing the model
- Refine the model
- Determine new possible solutions to setting the backwash mode
- Design how these weirs will be removed in a full scale plant or if a better alternative exists

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LET’S SEE HOW THE MODEL WORKS!