Filter Flow Control

FTTFC (Spring 2016)

Conducting backwash of filters required high flow rate. During low flow conditions, the required flow rate is achieved by redirecting flow from the other filters into the one being backwashed. The objective for the Filter and Treatment Train Flow Control team (FTTFC team) this semester was to design and construct a weir module that would allow the plant operator to easily redirect sufficient flow for filter backwash without shutting off other filters' flow, and without requiring calculations done by the plant operator. The goal of the design was to be easily constructible, easy to operate, strong enough to withstand water pressure and require no calculations for plant use.

Current & Future Research

The team designed several removable weir options and ultimately chose a hinged design. The design is similar to a dog door that will be shut during normal flow and open during backwash. The model was fabricated and tested under conditions simulating a 20 L/s plant. The weir module was strong enough to withstand the flow, was easy to construct and was simple to open and close even with the water pressure against it and therefore was a success. There was some significant leakage around the weir flap. The team also modeled leakage rate as a function of the size of the gap between the weir and the flap, and the graph displaying this relationship can be used to determine acceptable gap size for a desired maximum leakage rate (Figure 2). For flow rates other than 20 L/s, the following Mathcad file may be used:

gapmm.xmcd

The team successfully designed and tested a weir module to meet the identified criteria. The testing was conducted in DeFrees Hydraulics lab against a 20 L/s flow rate. The test verified calculations made for modifications to the previous design, which will improve ease of constructability and operation. Reducing leakage is an area that requires improvements and could benefit from further exploration. The team used slit rubber tubing as a gasket, which had some effect on reducing leakage, however a rubber-sheet gasket could be much more effective. This would increase the allowance for gap size given an acceptable maximum leakage rate.

Figure 1: Chosen hinged design for closeable flap (5/18/2017)

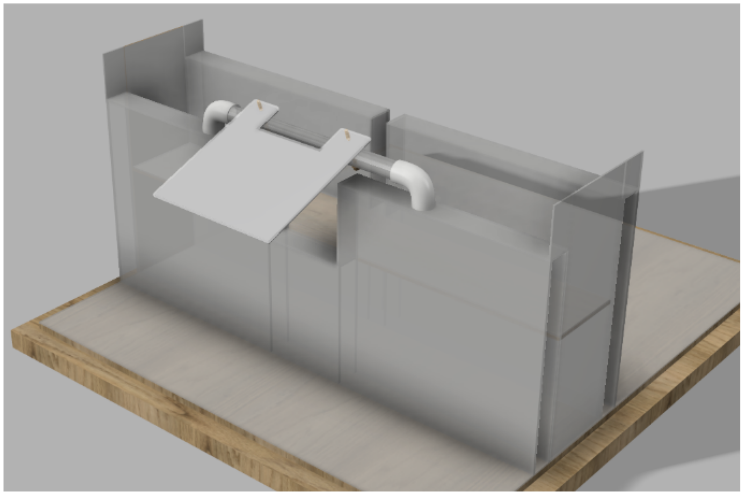


Figure 2: The constructed module in the flume before testing (5/18/2017)

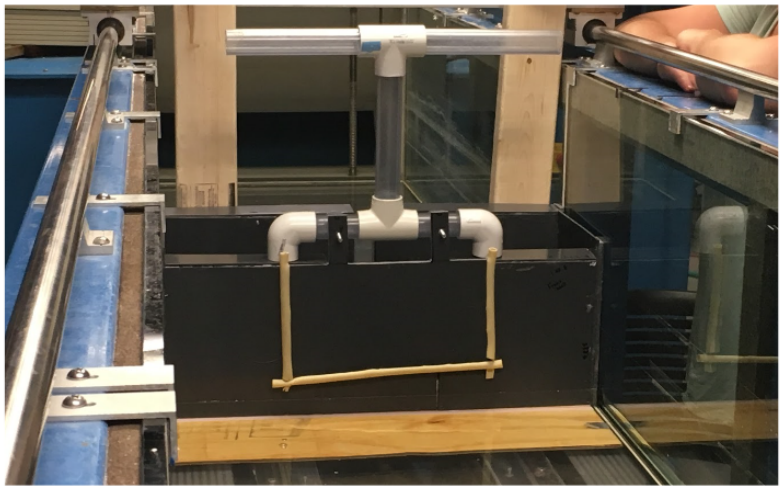
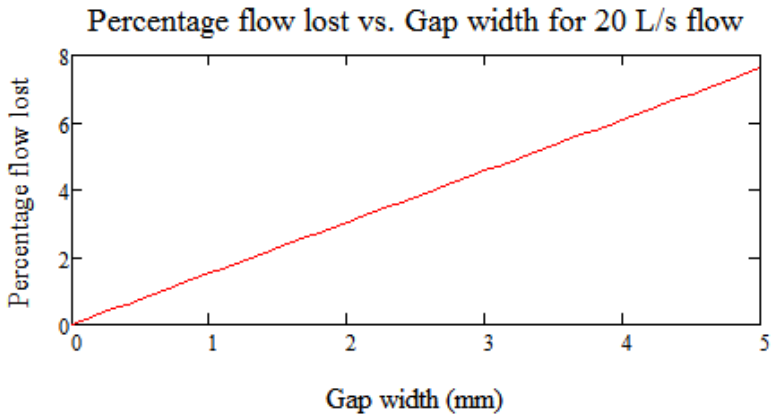


Figure 3: Leakage rate as a function of gap size (5/18/2017)



Team Members (Fall 2016)
Matt Cimini
Maile McCann
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Team Documents

	Challenges	Tasks	Teach-In	Symposium Presentation	Final Report	Final Presentation
Spring '17		FTTFC Task List Spring 2017.pdf	FTTFC Manual.pdf		FTTFC Final Report.pdf	Final Presentation
Fall '17				`Symposium		Final Presentation

Past Research

None.