

# HOLLOW FIBER MEMBRANE PROJECT

## WATER GROUP

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### Introduction

We installed a water filtration system in Arraiján, Panama, during the Fall of 2014. This project was a one-semester project because we needed to bring clean water to this community center as soon as possible. For this spring, our new client is Sawyer Water Filters and we will be testing the life of the hollow fiber membrane (HFM) filters that Sawyer has distributed all over the world.

### Clients

#### FALL

- Rio Missions—focuses on humanitarian efforts
- Dan Cotton—our contact in Panama



#### SPRING

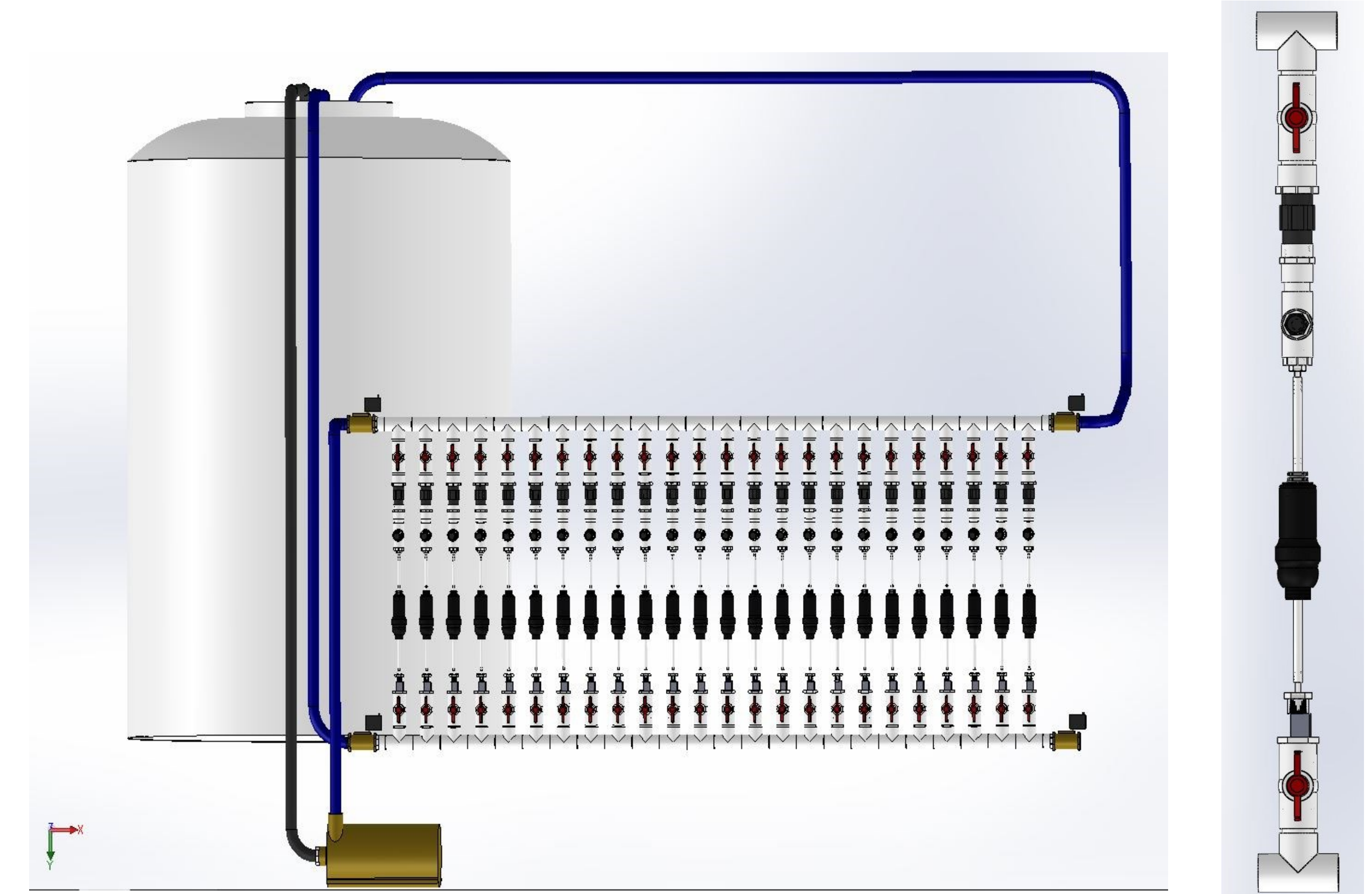
- Sawyer—major manufacturer of filtration products



### Sawyer Life Cycle Study

Sawyer, a major water filtration company, has a guarantee on their products that they can last through one million gallons. They have requested that our group perform a long-term study of their filters. With their funding, HFM is designing a system that will test 24 filters simultaneously at a constant pressure of 10psi. The system will run unclean water through for an hour at a time, and then it will automatically switch to backwashing with clean water for a minute.

Tests will be run periodically to determine if the filters are still functional. The tests will be conducted until we have reached one million gallons. Our tests will be performed after 50K, 100K, 250K, 500K, 750K, and 1 million gallons have cycled through, if not more often. The tests will help determine if we have a broken membrane, or if biological substances (such as viruses or bacteria) can get through.



### Filtration and Installation For Arraiján (FIFA)

FIFA spent the fall semester helping to provide a community in Arraiján, Panama, with a system that will let them drink from a nearby ravine and from the city's currently unclean tap water system. We used a pump to transport water nearly twenty feet upward from the creek to the filtration system. It was then held in a storage tank that provided easy access for the community. The filtration system required a filter that would adequately remove particulates, bacteria, and viruses on a daily basis.

In January of 2015, Jon Hepner along with a few other members of the Collaboratory, traveled to Panama to install the system. The installation was successful and functional. The water is able to be purified and is drinkable. Using a large storage tank, FIFA was able to allow the clean water to be safely stored in order that the people in the community be able to access the potable water when the creek is low or the city's tap is unavailable.



### Panama System Update

Arraiján, Panama, was out of city water for the entire month of March, but the ravine from which the system pumped from continued to flow. Fortunately, the community center could still pump from the ravine and provide filtered water to the entire community. Brennan Neal (Messiah College Alumnus), who works for Crossroads Christian Academy in Panama, performs maintenance on the filter system once or twice a month.

### Future Work

One of our alternatives for the system in Arraiján was to use a biosand filter. Upon building, we had major issues with the flow. Although we installed an HFM system, we would like to return to biosand and try using water spiked with bacteria and particles to get more reliable results. Variables such as sand fineness and head will be adjusted and tested.



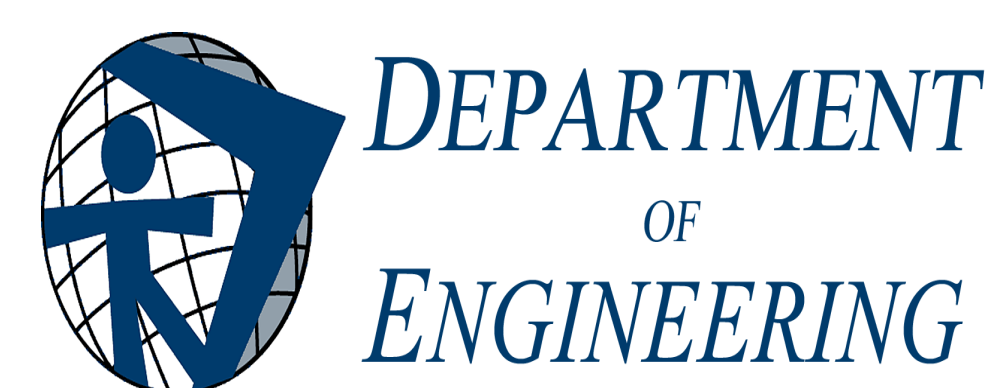
Prototype of Biosand Filter

### Acknowledgements

- Dr. Thomas Soerens – Group Advisor
- Tony Beers – Project Advisor
- Messiah College
- Dan Cotton – Rio Missions director
- Sawyer Filter Products
- Ken Kok and the IWP group

### Conclusions

After testing the water filtration system here in the U.S., we sent Jon to Panama with a few other helpers to install the system. It was a successful trip and the system was fully functional by the end of January. As for our most recent project, we had submitted our materials list and budget in mid-April. Once we get permission from Sawyer, we will begin building and implementing our system.



For More Information, please visit the Collab wiki page. Scroll over "application groups" on the left side of the screen followed by "water" and finally "Hollow Fiber Membrane Sys-

The Hollow Fiber Membrane presentation will be given at 1:20 pm in Frey 150