Bio-Filter Reactor Scale-up
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Global Engineering Program

**PURPOSE**

Team Maji Purpose Statements

1) To scale up the bench scale bio-filter reactor developed by the Column Group
2) To design a bio-filter reactor capable of processing 1000 liters of raw water per day
3) To develop an educational program that will address the construction, maintenance and utilization of the filter

**BACKGROUND**

Bio-Filter Reactor – Lab Scale

Seven bio-filter reactors were designed and built in analogous proportions. Three distinguishable layers of packing material: Base layer – pea gravel

Second layer – coarse sand

Final layer – fine sand

Testing

To test the effects of system performance utilizing varying qualities of packing material:

Three reactors (A, B, C) contain non-industrially processed, manually washed fine sand

Four reactors (D, E, F, G) contain industrially processed fine sand

To test the disinfection capability of ACX, a copper alloy (Huang et. al. 2008) developed by Aqua Clara:

Six bio-filter reactors (A, B, C, D, E, F) and ACX distributed throughout the initial 2 cm of the fine sand layer

One bio-filter reactor (G) – no ACX

**CURRENT WORK**

It was determined that a cylindrical, 5000L tank, constructed from HDPE plastic, would be able to effectively house the packing material and to process the daily raw feed water flow rate of 1000L. The tank comes with a lid that will prevent contaminants from reaching the water and from disturbing the bio-layer of the filter.

Schematics:

![Schematic of the bio-filter reactor](image)

**FUTURE WORK**

**SHORT-TERM:**

- May 9th to 14th: the team will:

  1. Construct the bio-filter at St. Catherine Girls School in Eldoret, Kenya.
  2. Collect water samples and data on the water quality of the Rift Valley

**LONG-TERM:**

- Purdue University student will continue to develop a partnership with Moi University in Eldoret, Kenya. This will result in:

  1. Continued monitoring of the aforementioned system by Moi University graduate students.
  2. Continued design refinements to apply this system, with the addition of a hollow fiber filament, to a medical facility setting.
  3. Scale-up the system to treat the original 4000 liters of raw water per day

**CONCLUSIONS**

Team Maji recognizes that this is the first step to establishing a partnership between Purdue University and Moi University. The technical feasibility and system design are relatively simple portions of the project scope as compared to establishing an open collaboration between Purdue University, Moi University and Aqua Clara International. Establishing a closer partnership with the aforementioned stakeholders will eliminate the complications that have arisen in this phase of the design process.

**REFERENCES**