TARGETING WATER POLLUTION AND HYDROELECTRICITY POTENTIAL WITHIN LOW-INCOME AREAS

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Introduction

- Issues
  - Local pollution
  - Low-income communities
  - Social economic advantages and disadvantages

Problem

Can a device be designed and constructed to produce a substantial amount of electricity (~20V or more) and efficiently filter water?

Engineering Goals

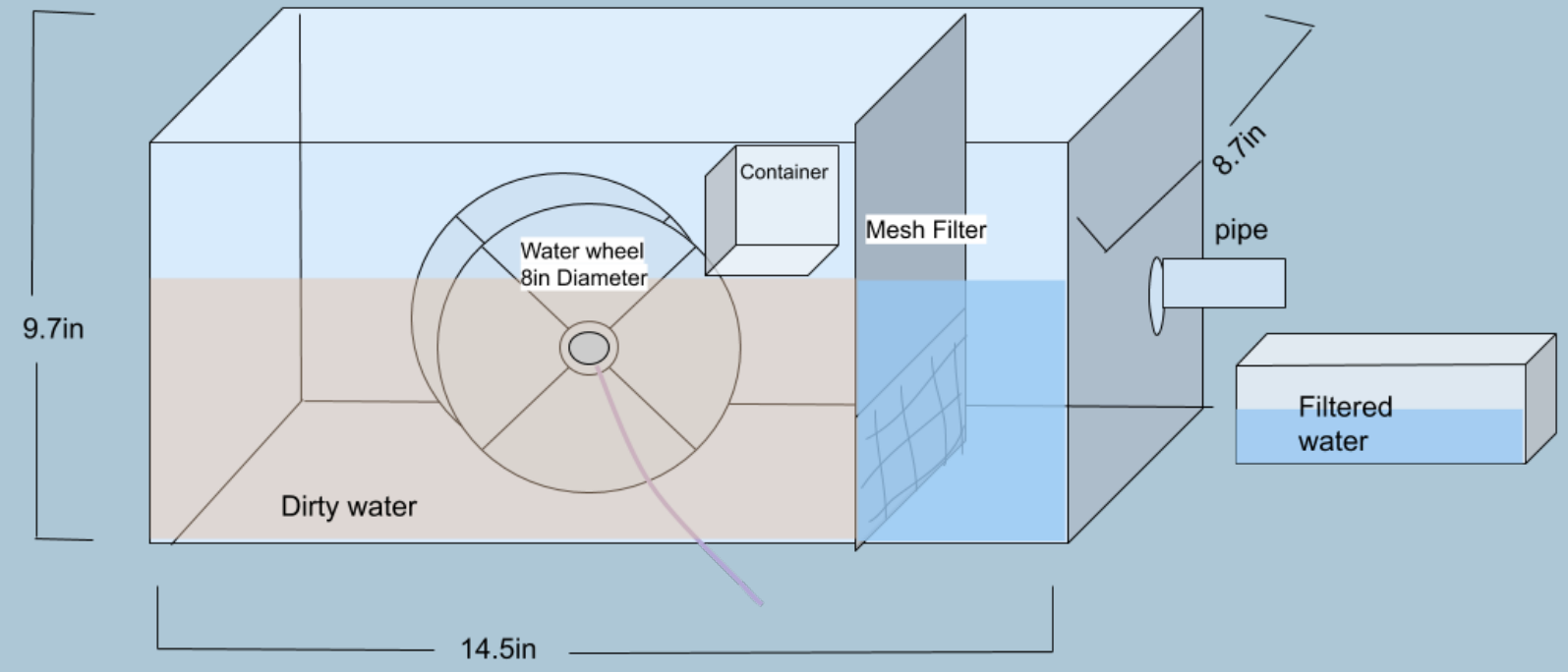
The model will...

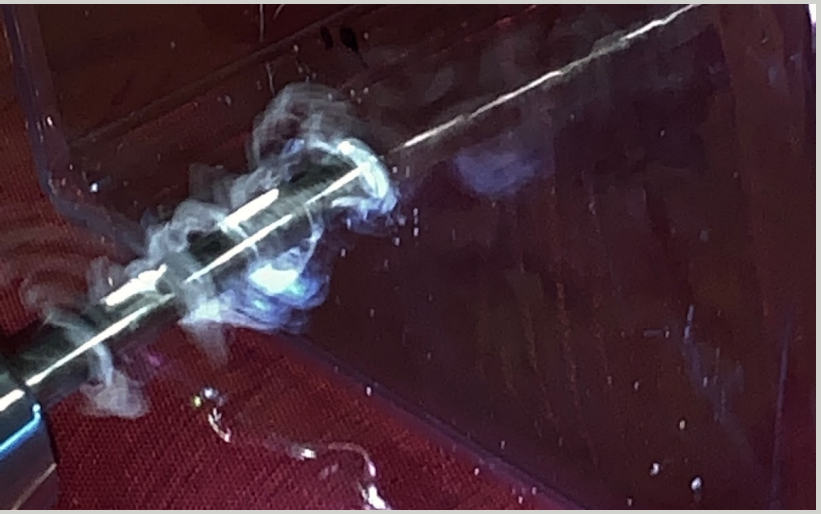
- Decrease the TDS by ~25% or more
- Decrease EC by at least ~15%
- Produce a substantial amount of electricity measured in dc voltage
  - 15-20V minimum
- Have a pH of 6.5-8.5
- Overall, the device should have an end result of cleaner water (visually cleaner) after going through the device and produce hydroelectricity

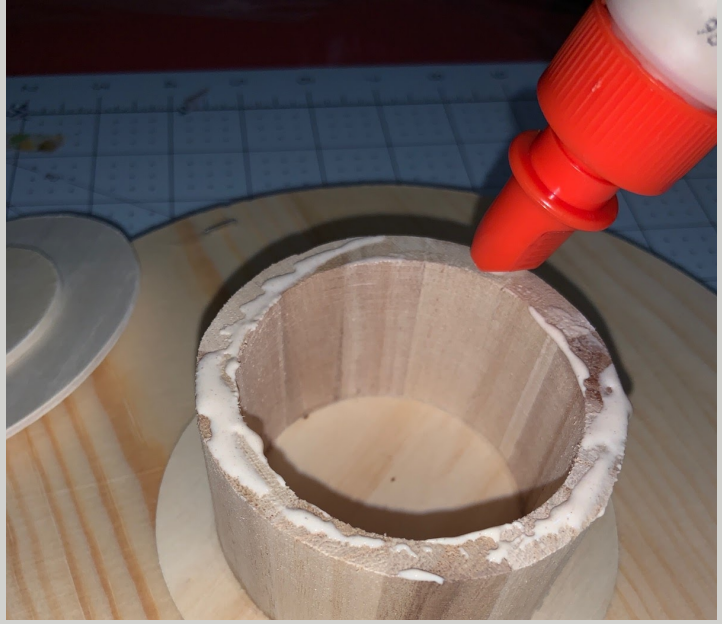
Methods

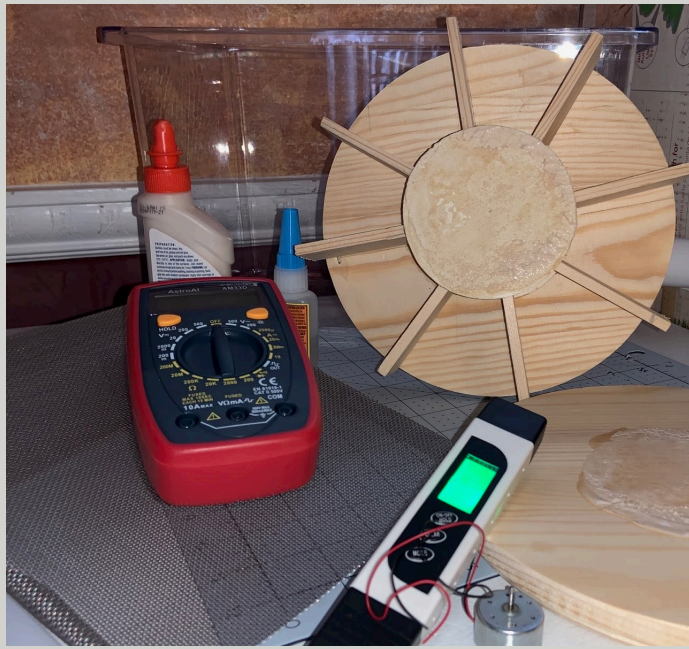
1	**Start of Phase 1.** **Selected water samples were tested for pre-TDS, EC and pH data.**
2	**Ran selected water sample through device for 5 minutes**
3	**Retested water sample for TDS, EC, and pH.**
4	**Conducted 10 trails per water sample for a total of 30 test trials.**
5	**Start of Phase 2** **Modified the device by adding a turbine..**
6	**Conducted 10 with pre-filtered water while multimeter measured voltage output.**

Proposed Device Design

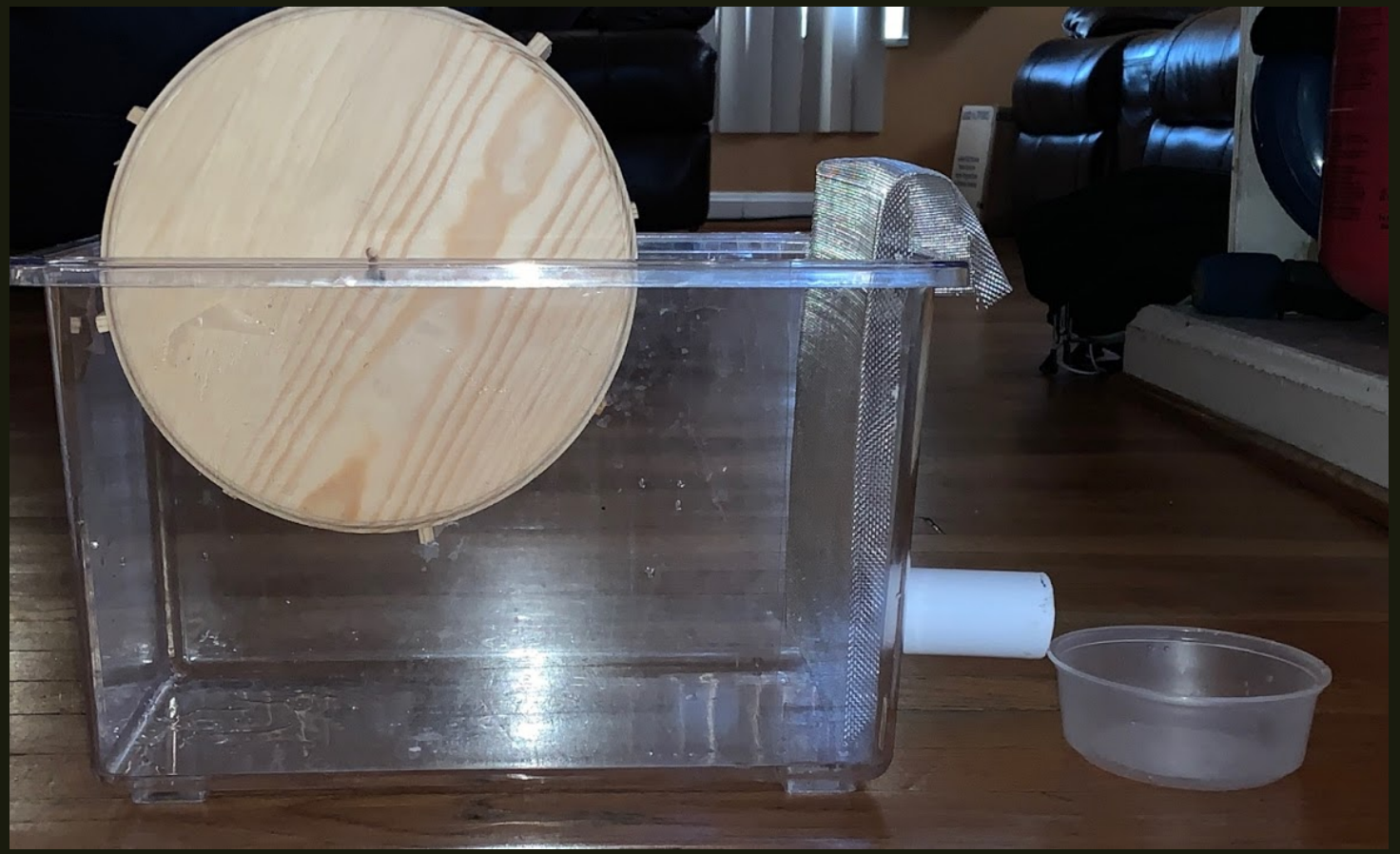








CONSTRUCTION

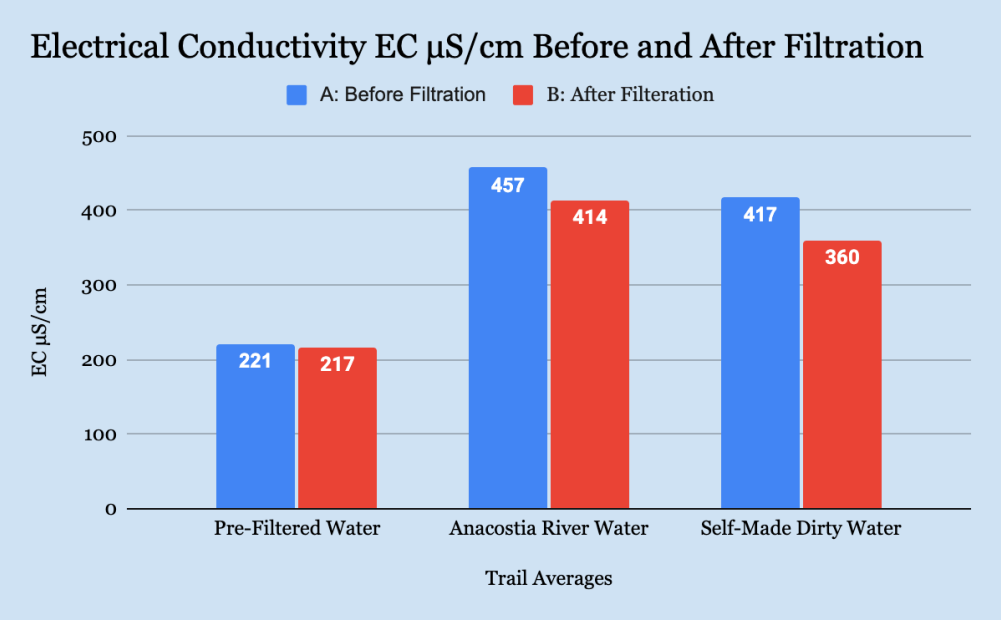


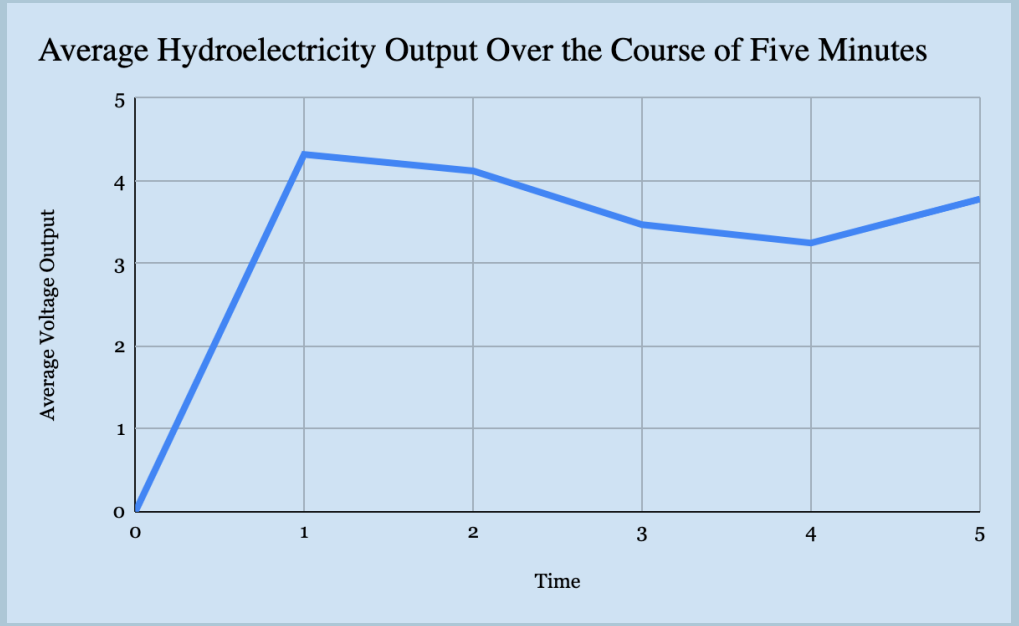
CURRENT STATE OF DEVICE

Major Components and Devices

- DS Meter Digital Water Tester 3in1
  - Tested for EC (in µS/cm) and TDS (in ppm)
- pH Strips
  - Measured for pH
- Digital Multimeter
  - Measured for dc voltage (in V)
- Water Wheel & Turbine
  - Produced hydroelectricity
- Mesh Filter
  - Aids in filtering large components

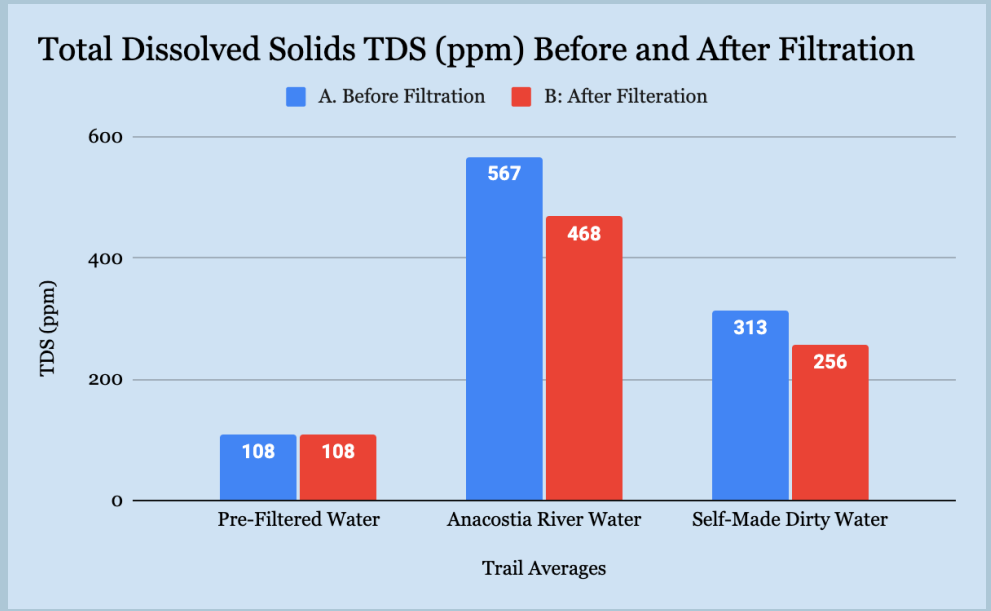
Graphs

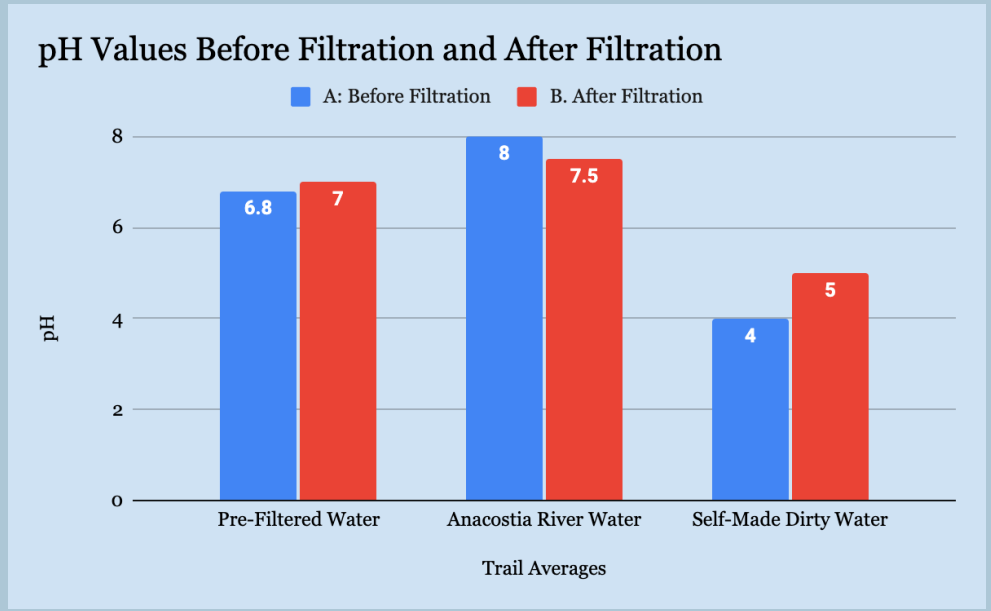

Electrical Conductivity EC µS/cm Before and After Filtration
A: Before Filtration
B: After Filteration
500
400
300
200
100
0
EC µS/cm
221
217
457
414
417
360
Pre-Filtered Water
Anacostia River Water
Self-Made Dirty Water
Trail Averages


Average Hydroelectricity Output Over the Course of Five Minutes
Average Voltage Output
5
4
3
2
1
0
0
1
2
3
4
5
Time

Summary Results

- Improvements in..
  - TDS by an average of 18% ppm
  - EC by 8% µS/cm
  - pH in ideal ranges for pre-filter water sample and Anacostia River water
- Hydroelectricity
  - Average production was 3.97 V
- pH Self-Made Contaminated Water before and after were not in ideal range
- Most engineering goals were not satisfied





Conclusion

- Almost all test factors showed some type of improvement
  - Showed potential
- Most outlined engineering goals were not accomplished
- Future modifications and testing needed
- At current state, device would not be able to significantly assist low-income communities due to unaccomplished of outlined goals

Future Research

- Redesign
  - Focus on water wheel's rotations ability and electrical output
- More research on similar devices that focus on water quality factors and hydroelectricity output
- Attempt to simulate river flow in redesign
- Hypothetical scaling the device to…
  - Calculate the amount of electrical production in a real-life setting
  - Calculate amount of financial relief proved in a realistic setting

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