

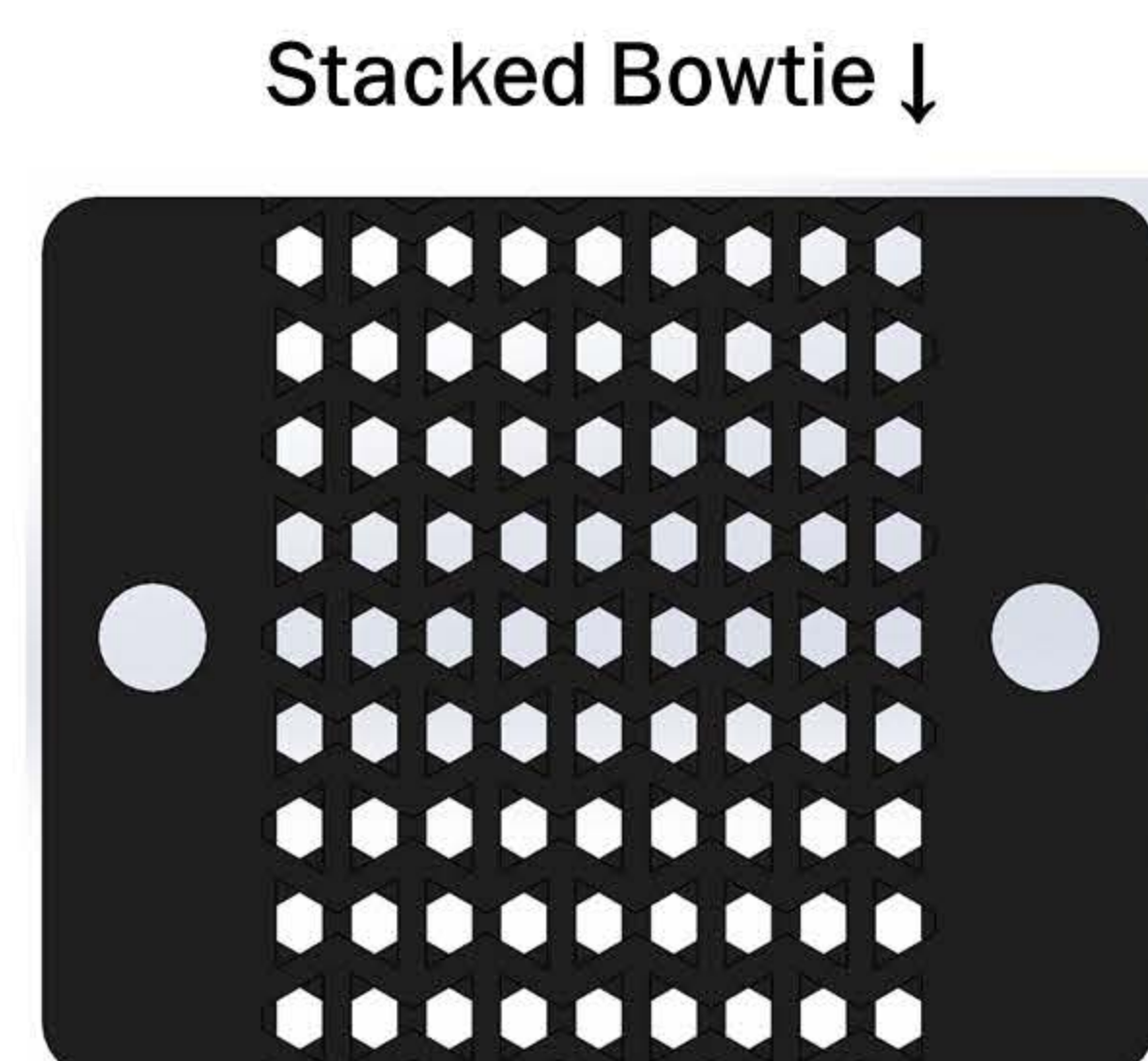
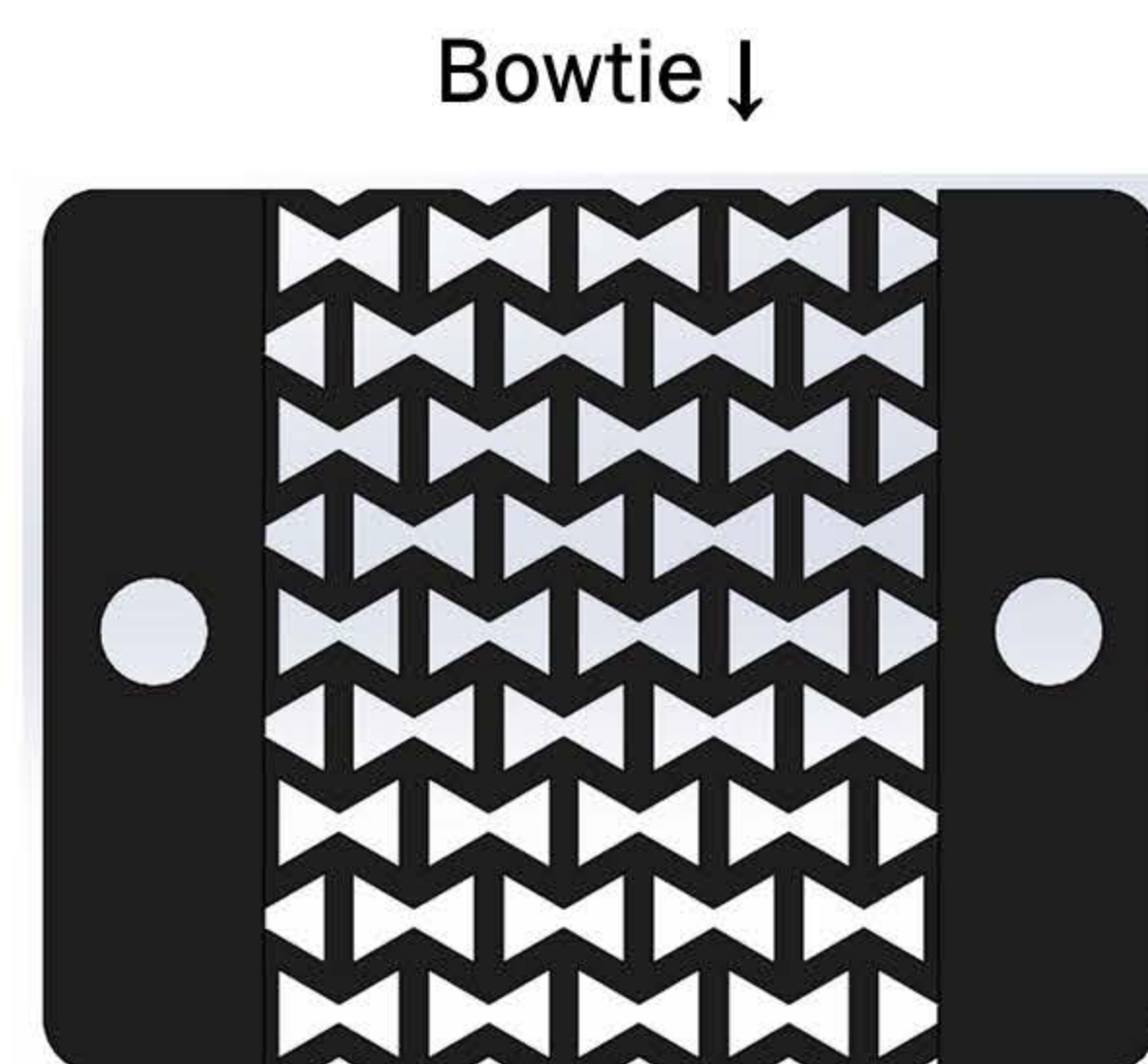
Problem: In the industrial world we live in, there is a need to remove specific undesirable components from a given process. This filtering can often result in needing human technicians to change these filtering devices. These filters can be located in a hazardous environment, and the changing of these filters puts the safety of the technicians at risk.

Objective: Create a smart filter using an auxetic geometry that is capable of filtering out 3mm particles from water

Key Requirements:

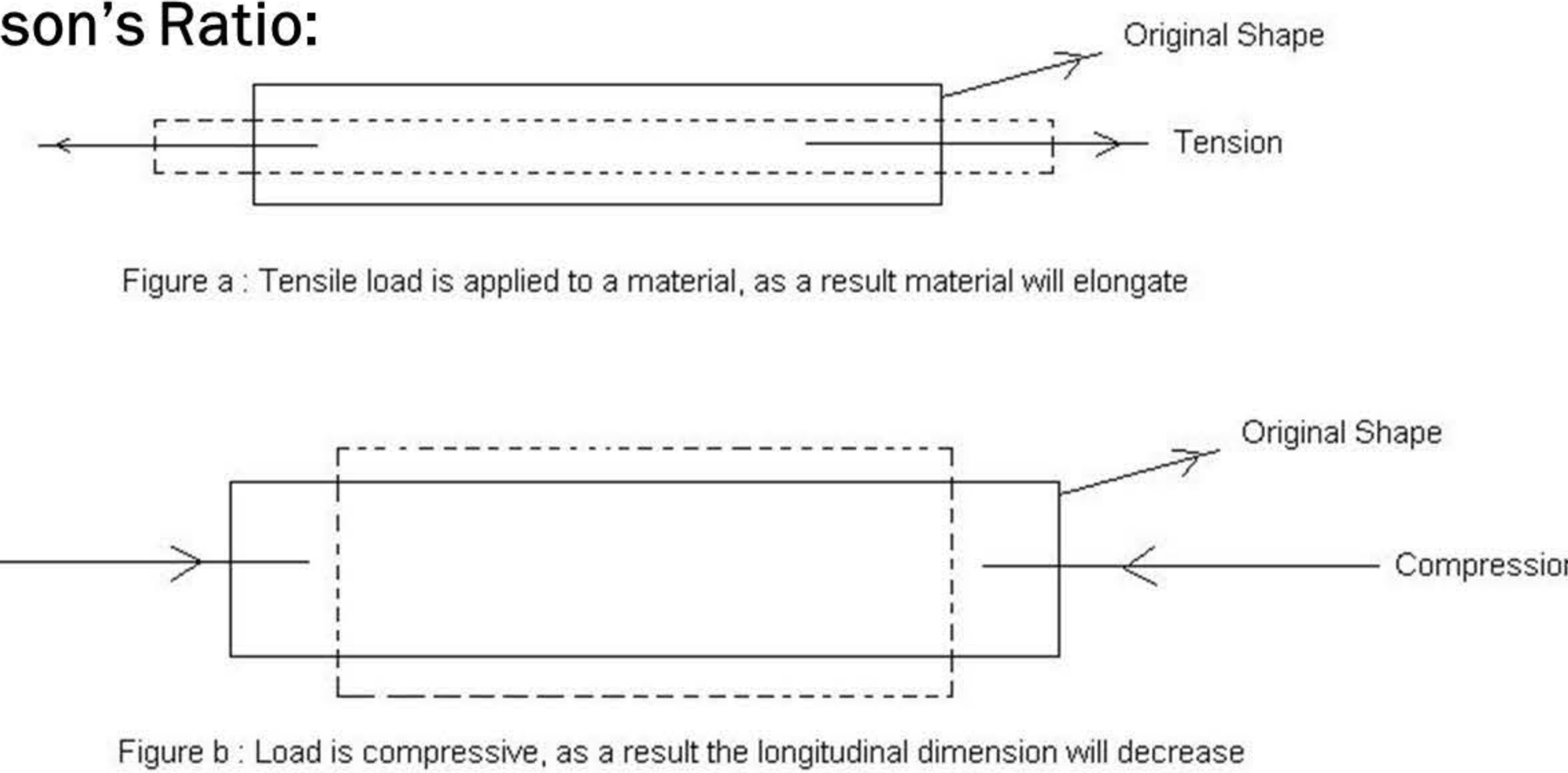
- Remotely cleanable
- Build demonstration
- Spend < \$1,000
- Filter 3mm particles
- Environmentally friendly

The Final Design: Using Negative Poisson’s Ratio the bowtie design was overlaid on itself to create the “stacked bowtie”. A housing was designed around this improved auxetic design to allow the filter to be plumbed into a water circulating system



Design Principles: When people learn about how forces interact with objects in the world, they learn about Poisson’s Ratio. This principle is something that can’t be forgotten. With clever geometry Poisson’s Ratio can seem to work the opposite as depicted below

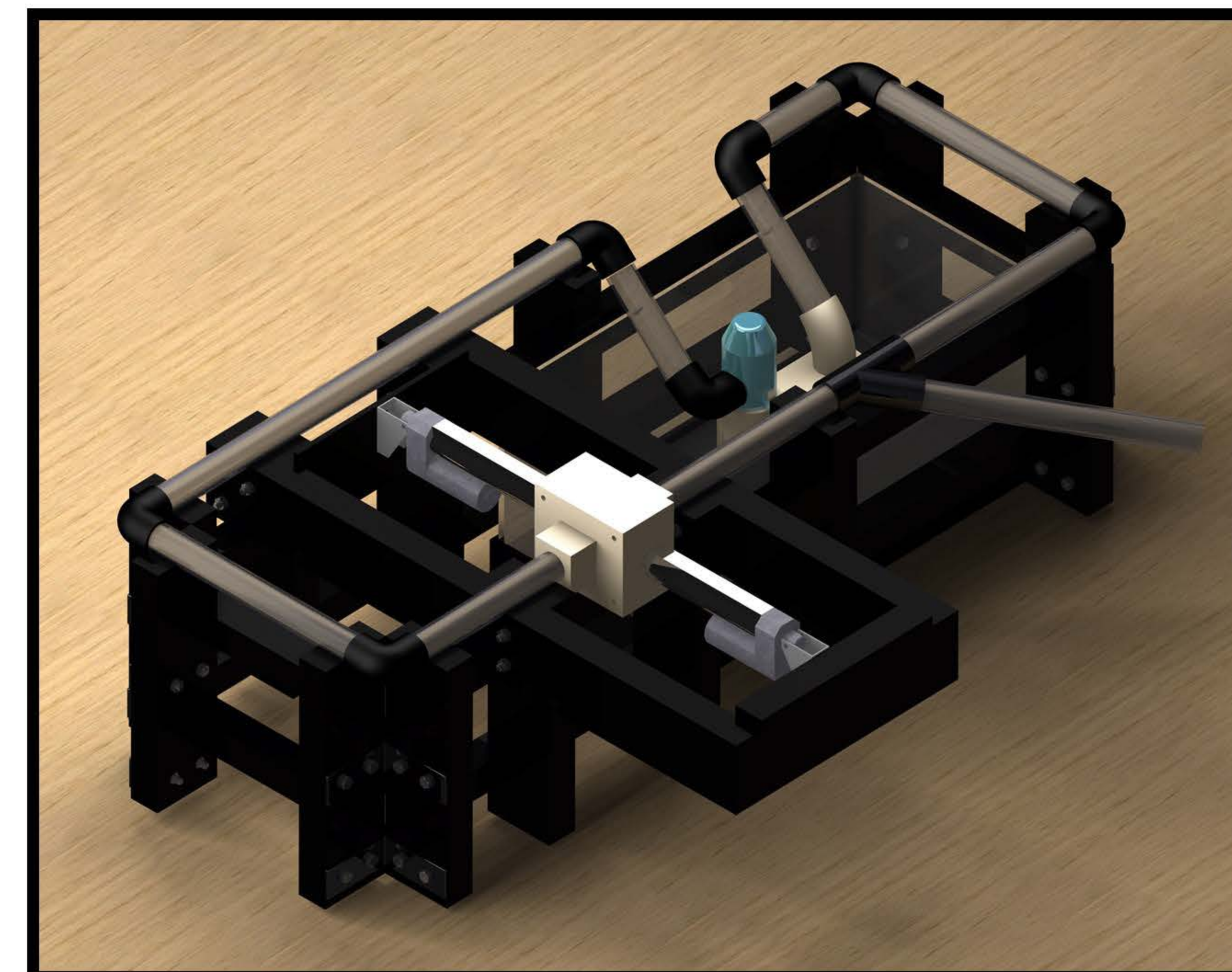
Poisson’s Ratio:



Validation:

- Hand testing filter for open pore size clearance
- Tinker Cad online Arduino code shows proper function of software
- Frame can support weight of human, so the force applied during normal operation is good
- Pump models on EES show that our pump has much more head than necessary
- Linear actuator has 5 times the force capability than is needed to open filter for cleaning

Final Piping System



Thank You:

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