MICROLESS

"Purify your water, protect your health, and preserve the planet with our microplastic-busting filter. Clean water, clear conscience – it's that simple!"

Is this problem worth the stress it's causing?

- Microplastics, those sneaky plastic bits less than 5 millimeters, are causing quite a stir!
- They mess up the environment, harming marine life, and causing all sorts of trouble.
- When it comes to us humans, we're unknowingly chowing down on 39,000 to 52,000 particles a year, and that number goes up if we breathe them in.
- American adults consume 126 to 142 particles a day and inhaling 132 to 170 more.
- Globally, we're swallowing about 5 grams of microplastics per week, which is like carrying a credit card's worth of plastic in our bodies.
- Time to tackle this plastic problem with a smile and a bit of determination!

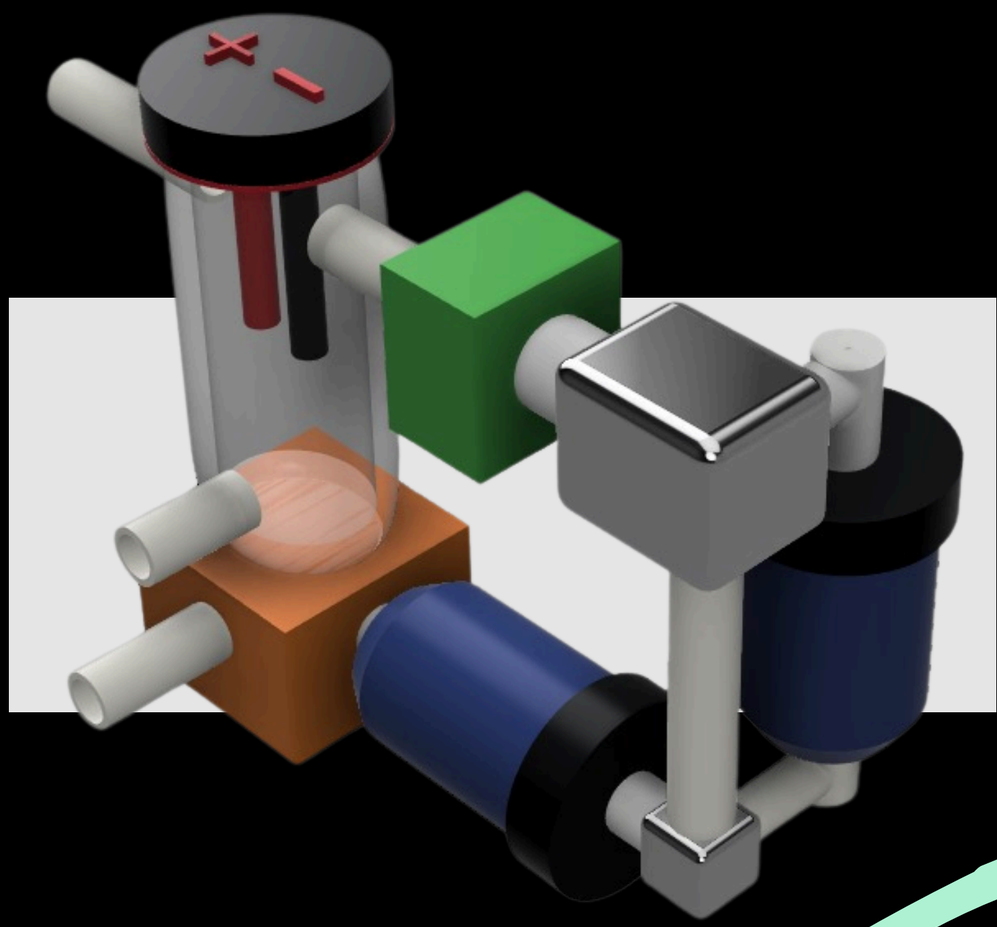
Where does it come from?

- Laundry: Synthetic clothes shed microplastic fibers during washing, contributing significantly to microplastic pollution.
- Personal Care Products: Items like facial scrubs, toothpaste, and cosmetics with exfoliating beads contain microplastics that end up in waterways.
- Disposable Hygiene Products: Flushing items such as contact lenses, feminine hygiene products, and wet wipes directly introduce microplastics into wastewater.

By managing the microplastics exiting your household, we can effectively reduce this significant threat originating from homes.

Our Design

1. Compact, Eco-Friendly Design: The filtration device connects directly to the existing outlet pipe using an external attachment, minimizing disruption to the home's plumbing. This compact design helps keep the system cost-effective.
2. Natural Filtration Materials: The use of natural materials like coconut coir as the filter media contributes to the eco-friendliness of the system. Coconut coir is a renewable, biodegradable resource that can effectively trap microplastic particles.
3. Simple Maintenance: The system is designed with user-friendliness in mind, ensuring that maintenance tasks are straightforward and easy to perform. This allows for long-lasting microplastic capture in the home's wastewater without requiring complex upkeep.



OUR 3 STEP SOLUTION

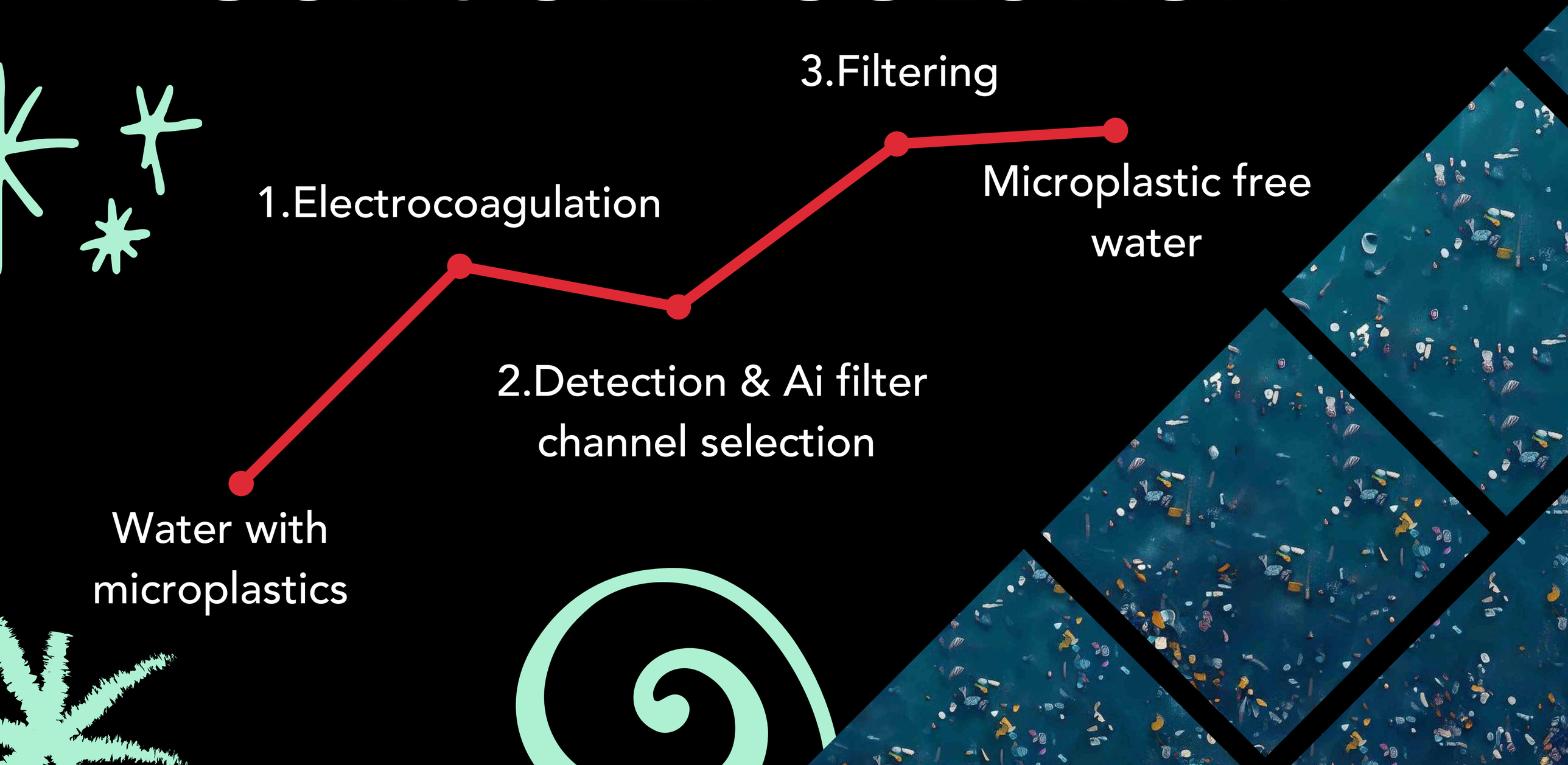
Water with microplastics

1.Electrocoagulation

2.Detection & Ai filter channel selection

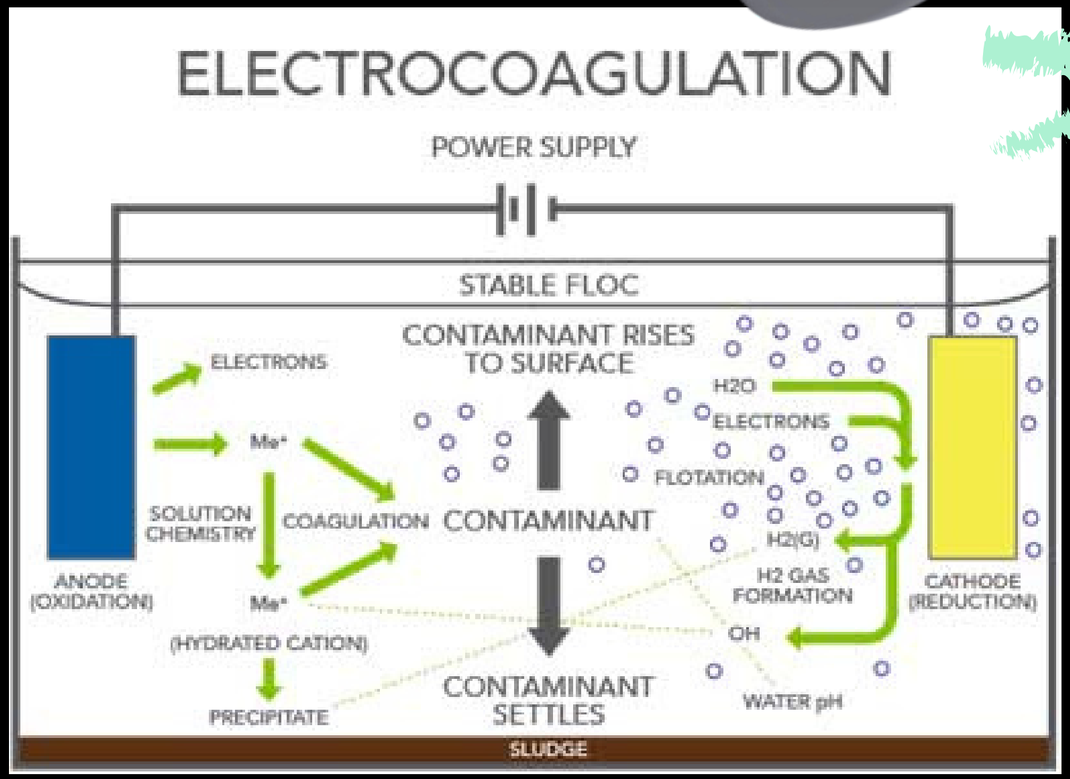
3.Filtering

Microplastic free water



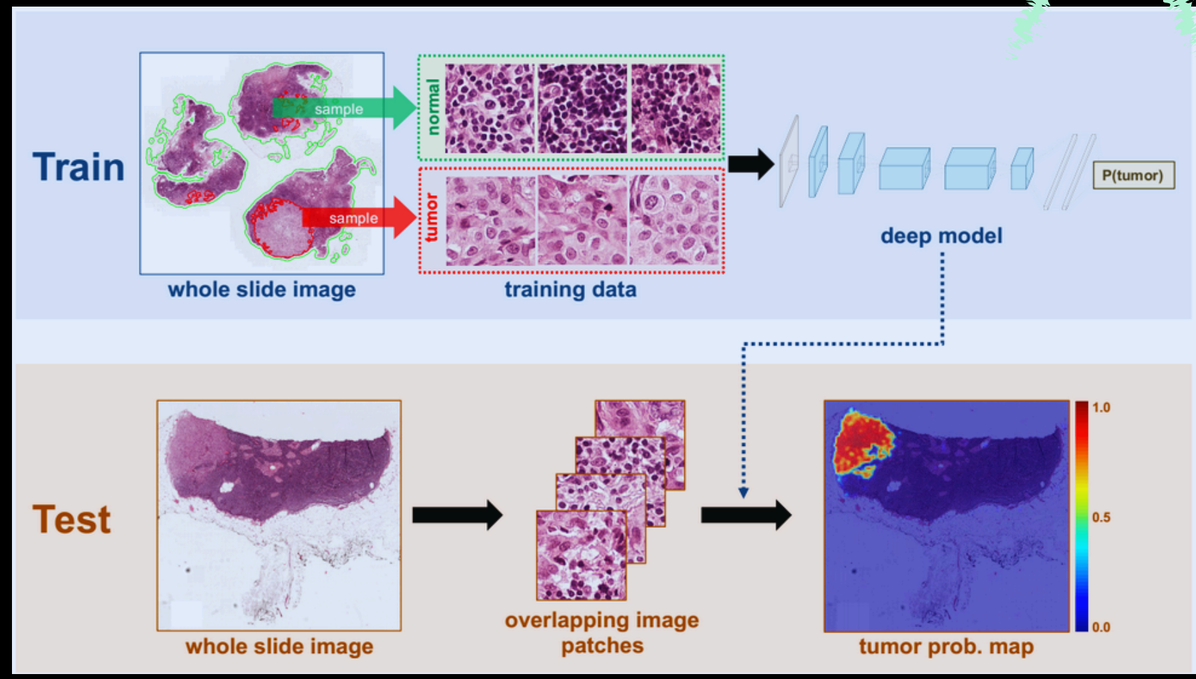
ELECTROCOAUGULATION

Electrocoagulation is utilized in our process to enhance the efficiency of the filters by promoting the aggregation of microplastics, making them easier to capture and remove. This process increases the removal efficiency of microplastics by creating larger flocs that are more effectively trapped by the filtration system. For example, electrocoagulation can boost the removal rate of microplastics by up to 90%, significantly improving the filtration process. Studies have shown that the size of microplastics can increase by approximately 50-90% after electrocoagulation, making them more efficiently captured by the filters



Detection

- To detect microplastics, the AI-powered system utilizes advanced light-based sensors like Raman spectroscopy and photoluminescence to analyze water samples in real-time.
- The AI determines the concentration of microplastics present, allowing it to dynamically alter the filtration pathway by selecting the most suitable filter channel based on this information.
- The fluctuating levels of microplastics in outgoing water make the AI crucial, as by choosing the filter based on the amount of microplastics, it enhances efficiency, extends filter life, and ensures optimal microplastic removal.



Our microplastic detection and filtration pathway adjustment system operates similarly to cancer cell detection systems . Just as AI is used in healthcare to identify and target cancer cells for treatment, our system detects and addresses microplastics in water to enhance filtration efficiency.

GAC

The key mechanisms by which GAC filters are able to remove microplastics are:

- Adsorption: The porous structure and high surface area of GAC allow it to effectively adsorb and capture microplastic particles
- Size Exclusion: The small pore sizes and tight packing of the GAC granules act as a physical barrier, preventing the passage of larger microplastic particles and trapping them within the filter.
- Electrochemical Interactions: Studies have shown that the surface chemistry of GAC, including the presence of functional groups, can create electrochemical interactions that further enhance the capture of microplastics

Before electrocoagulation, the efficiency of the GAC filter in removing microplastics was around 76.5%. However, after the addition of electrocoagulation, the efficiency increased to 96.4%

Coir

The utilization of biofilm-enhanced coconut coir filters has proven highly effective in removing microplastics from water, with removal efficiencies ranging from 82% to 92%. These filters work by providing a surface for microplastics to adhere to, effectively capturing and removing them from the water. By utilizing coconut husk fragments as a filtering medium, we not only benefit from their affordability and effectiveness but also contribute to recycling a natural resource. This eco-friendly solution not only showcases high efficiency in microplastic removal but also aligns with sustainable practices, making it a valuable component in wastewater treatment processes.

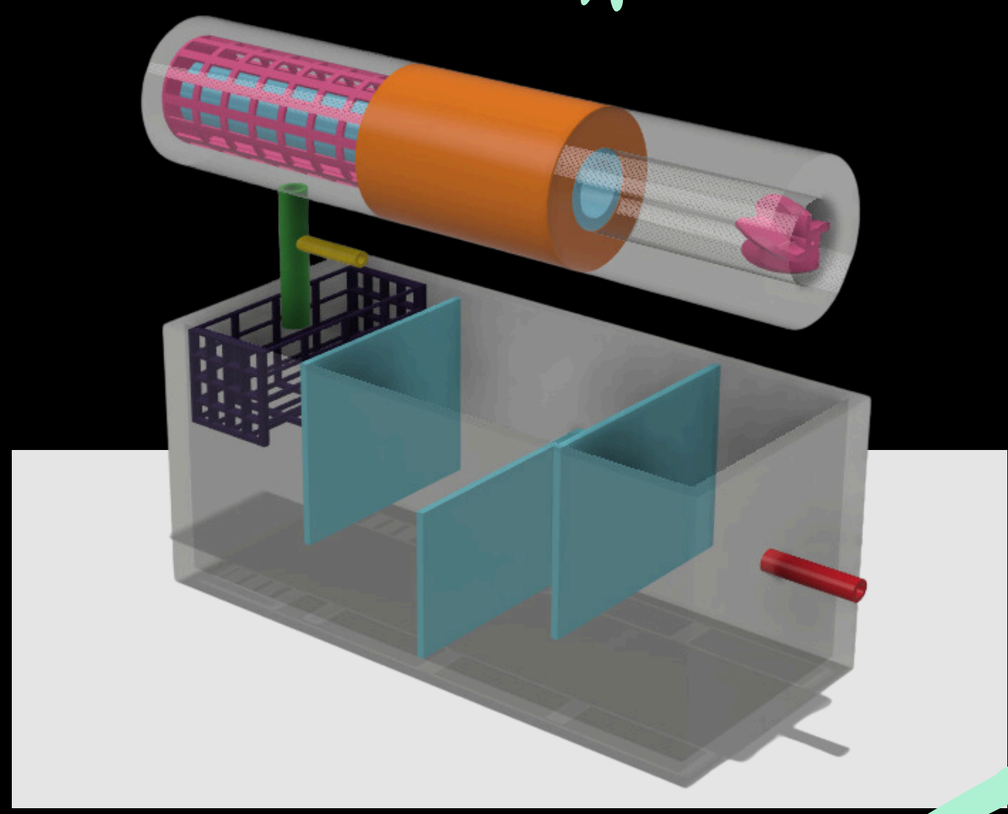
Cost Analysis

Electrocoagulation system	$20 - $30
GAC filter	$8 - $10
Coconut Coir filter	$2 - $5
PVC pipes	$5
Total:	~ $40

OUR DESIGNS

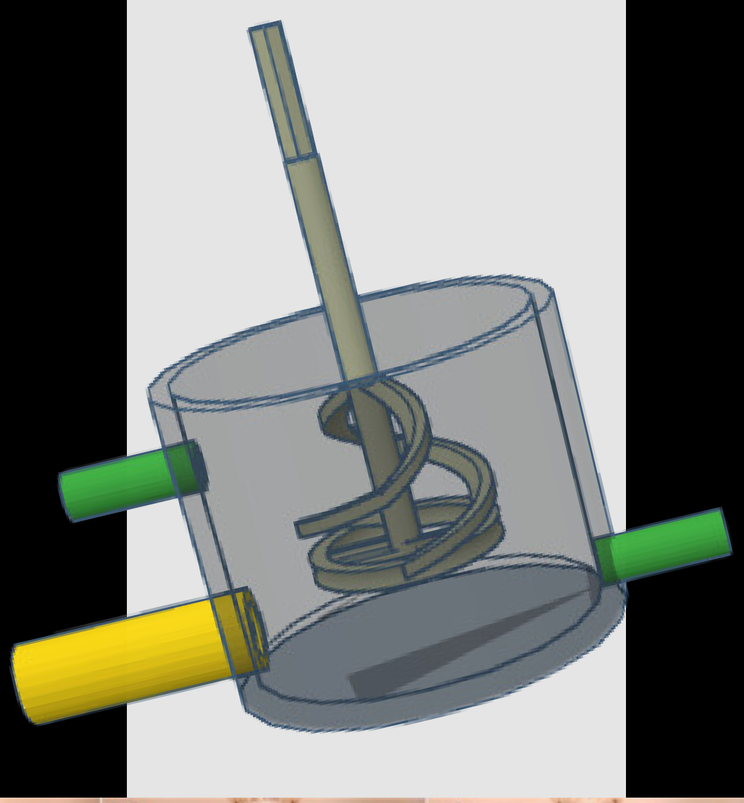
THE TRAP

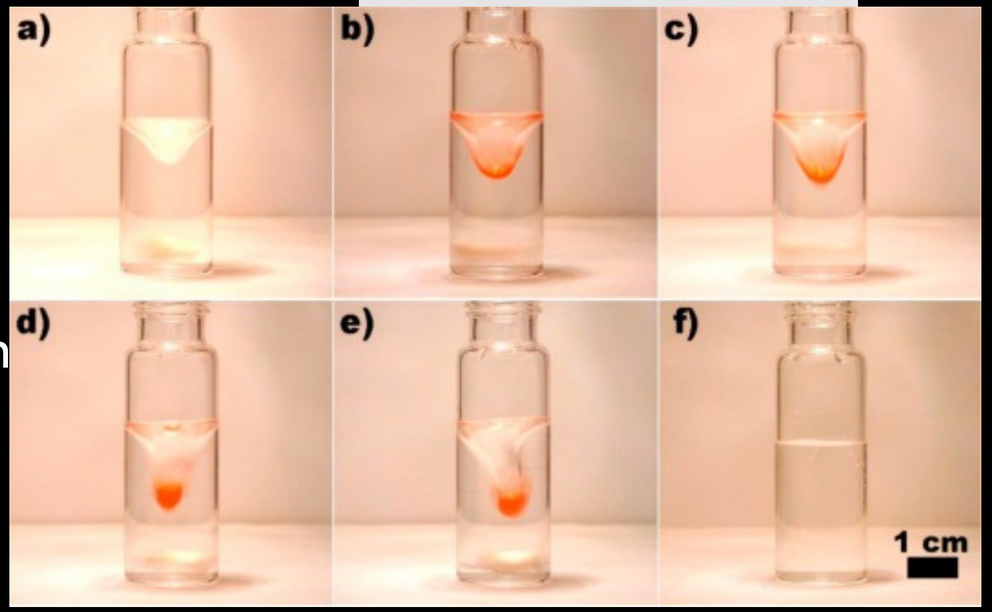
The design incorporates a filter inspired by the Samsung washing machine filter, which effectively removes larger microplastics. This filter is enhanced by adding oil, leveraging the lipophilicity of microplastics to attract them(90% removal). The oil-microplastic mixture is then captured in a grease trap due to the immiscibility of water and oil. This innovative approach not only ensures efficient removal of microplastics but also simplifies their capture in the grease trap, enhancing overall effectiveness.
Moreover, the seamless incorporation of this design with existing grease trap technology makes it highly adaptable and widely applicable.



Hydrophobic cotton

Taking a page from nature's playbook, our solution leverages superhydrophobic cotton to capture microplastics that evade traditional treatment (capturing around 90%). We treat cotton with a special coating, making it repel water while attracting microplastics. This approach, inspired by recent research showing a 99% capture rate for common microplastics (HDPE & PP) , offers significant improvement. The readily available and natural cotton makes this bio-inspired filter potentially cost-effective and scalable for both homes and municipal plants, capturing a much larger portion of these tiny pollutants.





Manta Ray

Our solution, inspired by manta rays' filter feeding, utilizes a biomimetic design to capture microplastics in wastewater. Traditional treatment plants capture around 90% of microplastics using methods like skimming and settling, but billions still escape. Our design incorporates microfiltration membranes with angled pores, mimicking the gill rakers of manta rays. These angled pores allow clean water to pass through while trapping larger particles, including microplastics ranging from 1 micrometer to 5 millimeters. Studies suggest biomimetic filtration can achieve removal efficiencies exceeding 97% for microplastics over 700 nanometers in diameter. This innovative system offers a promising solution for household and municipal wastewater treatment, potentially capturing a significantly larger portion of microplastics compared to traditional methods.

Future Goals and Sustainability

1. Build a prototype which involves using existing Ai models and training them to detect microplastics.
2. building a website to help you make informed choices. Compare products, learn about microplastics, and reduce your plastic footprint.
3. partnering with researchers, policymakers, and industry leaders to develop better solutions and stricter regulations.
4. We aim to implement our filtration systems in municipal plants and adapt them for global impact.