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11th grade
Mentor Project

Combatting Microplastic Pollution

With a Magnetic Filtration System

The Problem

Our oceans are polluted with numerous unnatural substances, **microplastics** being a primary issue.

What are **microplastics**?	Microplastics are tiny particles of large broken down pieces of plastic debris, no larger than 5 mm in size.
Why does this problem matter?	They pose as a threat to the environment because their tiny size allows them to travel into the food chain as they linger in the air we breathe, water we drink, and food we eat.
Who or what is affected?	They can accumulate in aquatic ecosystems, causing harm to marine life in addition to human life.
How can we help?	Reducing plastic consumption and proper recycling are easy tactics to combat the spread of microplastics.

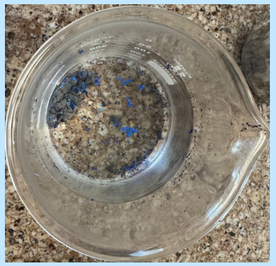
My Plan

1

Hydrophobic Interaction

My model uses iron filings coated in oil to attract microplastic particles. Microplastics are hydrophobic, meaning they are more likely to cling to other hydrophobic substances through hydrophobic interaction.

Microplastics in water



Iron filings coated with oil enter water, attracting hydrophobic plastics

2

Oil-coated iron particles are enabled to interact with microplastics. Because of this interaction, the microplastics can be easily removed from water using neodymium magnets.

3

Magnetic Seperation

Contaminated water flows through the water chamber. Neodymium magnets are placed around the circumference of the water chamber or in the downstream collection to attract the iron and microplastic substance toward the edges.

Magnets surrounding the circumference of water chamber

4

The microplastics surrounding the edges of the water chamber are manually collected and extracted from the water.

Water clarity prior to final filtration

5

The water is passed through a secondary filtration system, a mesh filter, to remove any remaining particles.

Final seperation stage

Microplastic free water

Benefits of My Model

My model is affordable and simple, and can be set-up with minimal technical requirements.

This model can be installed into existing community and industrial water systems. In coastal areas, it can be installed in storm drains to intercept runoff after rainfall events. In water treatment plants, it can serve as a pre-treatment or post-treatment step to specifically target microplastic contaminants. In marine conservation zones or harbors, floating units based on this model can continuously treat water. Schools and community science programs can also build small-scale versions for education and monitoring.

Cost

I designed the model with accessibility and sustainability in mind. With an average total of **$120-$150**, my working model consists of industrial-scale neodymium magnets ($90-$110); iron fillings ($5-$10); mineral oil (~$1); and filtration mesh ($20-$30).

Impact

Compared to advanced filtration systems that can cost thousands of dollars and require maintenance, this model is **affordable**, **scalable**, and **environmentally friendly**. It costs less than $0.10 per liter of treated water, it's scalablility can be replicated in larger systems using larger material, and it's environmentally friendly as reusable magnetic materials and non-toxic oil reduce waste and secondary pollution.

Support

Microplastic pollution represents a silent but severe threat to ocean health and human well-being. The proposed magnetic filtration system offers a practical, cost-effective, and scalable solution that maximizes the chemical nature of microplastics. With support from the community, this innovation can be a powerful tool in preserving our oceans for future generations, **we can turn the tide on microplastic contamination.**