

Utilizing Water-Oil Separating Membrane From Recycled Plastics

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Elevator Pitch

More than 8 million tons of plastic waste enter our ocean every year, along with oil spills and industrial waste that contaminate our water sources and current separation methods are inefficient and expensive. Our solution is a water-oil separating membrane made from recycled plastics. This will assist in the reduction of plastic waste and industrial waste harming our environment.

Project Objectives

- Prevent industrial waste from entering the ocean.
- Removing plastic waste and preventing it from harming the environment
- Recycling high-density polyethylene and using it to separate oil from wastewater.
- Reduce the cost of water-oil separation.

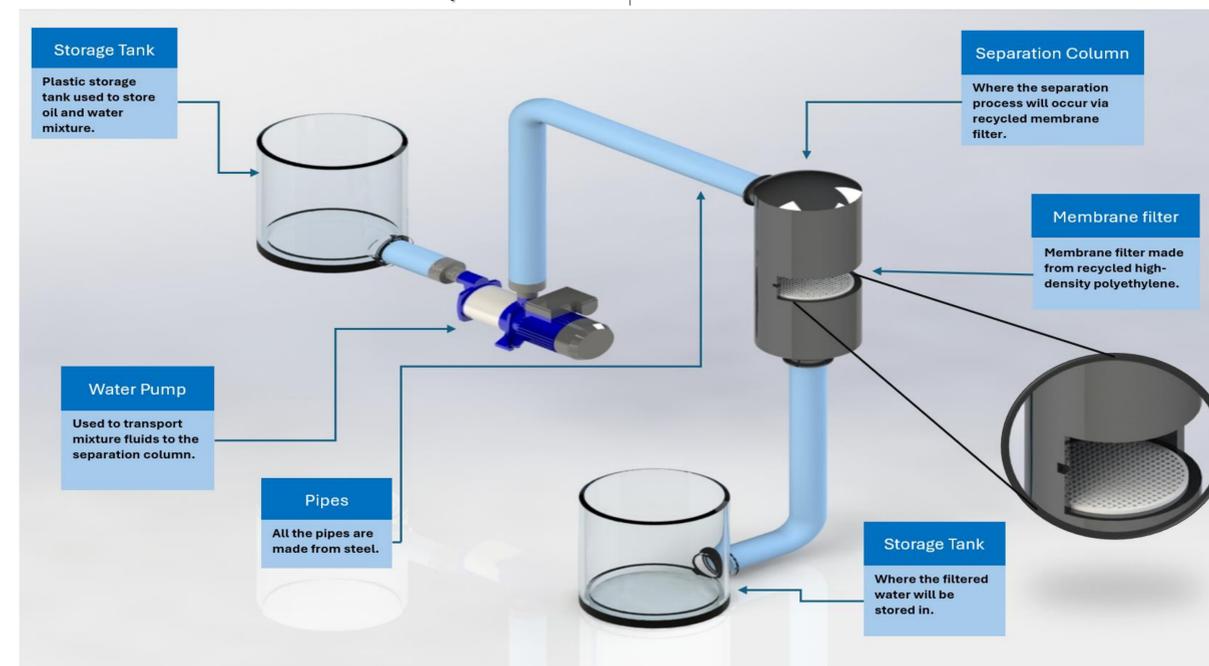
Project Impact

Our project recycles plastics into membranes, reducing pollution and energy use while offering a cost-effective, eco-friendly solution aligned with Vision 2030.

Product

$$\text{Permeability of Membrane: } Q = \frac{kA\Delta P}{\mu L}$$

$$\text{Oil separation efficiency(\%): } \left(1 - \frac{C_{out}}{C_{in}}\right) \times 100$$

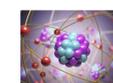


Specifications and Constraints

• Constrains

1. Cannot operate at High/low temperature ($5 < T < 60$)
2. Oil concentration must be $< 2\%$
3. Pressure cannot be above 60 psi
4. Viscosity must be $80 \text{ mg/ml} \leq \nu \leq 130 \text{ mg/ml}$

• Target Specifications



Size of void inducer
150-300 μm



Temperature
15-55°C



Filtration Efficiency
>95%

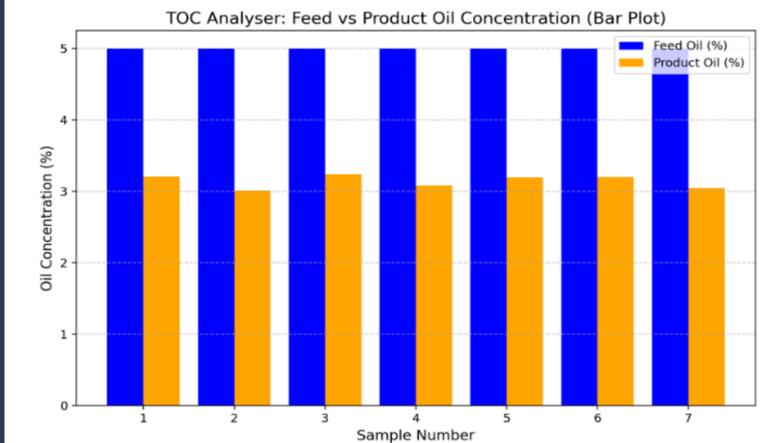


Oil concentration
<1.9%

Validation

Specification Met: Temperature, pressure, Void inducer size.

Not met: modular design, oil concentration, efficiency.



Average Efficiency Obtained: 37.234%

Conclusion

In conclusion, the project objectives were achieved by converting plastic waste specifically (HDPE) into producing a filter membrane to separate oil from water to preserve the environment. The most prominent results were reaching a separation efficiency of up to 40% with an acceptable flow rate, and a practical column with easy-to-change the internal filter.