SpillShield

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The Problem:

- Every year, 5 trillion newly hatched fish, 84,500 birds and thousands of sea turtles die due to oil spills.

- 1.9-2.5 billion litres of oil are lost every year due to oil spills

Project Goal:

This project aims to reduce/ mitigate oil spills from:

- Small spillages during transportation

- Employment to clean if the ships overturn

Methodology & Execution:

Inspiration:

This mechanism draws inspiration from sanitary pads, which utilise a polymer to absorb and trap liquids efficiently and quickly.[2] The magnetisation process takes inspiration from Arden Warner's TED Talk on how we can use magnetite to clean oil spills at home. [1]

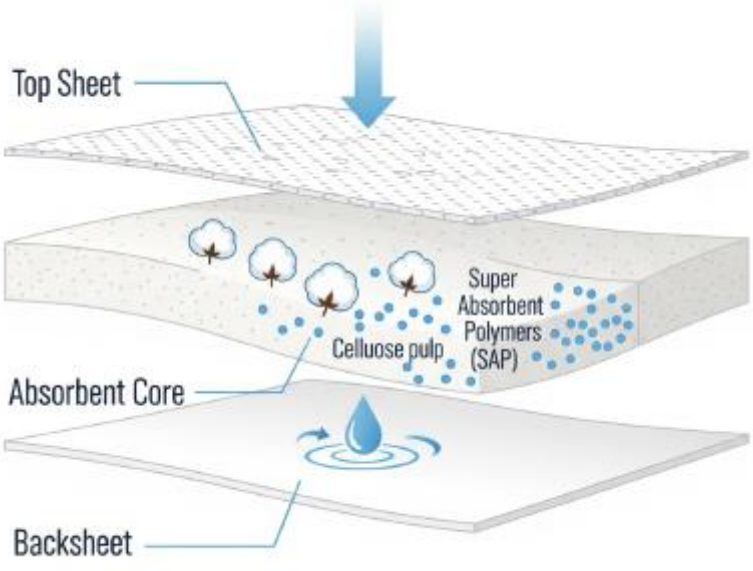

Fig 1, layers of a sanitary pad [3]

Mechanism: (Minor spillages)

Large pad-like structures made up of polypropylene sheets, which are anchored beneath ships, can be removable. These will be larger than the lower part of the ship, so that the polypropylene sheets (which are scientifically proven to be oleophilic and hydrophobic[4], allowing them to absorb the oil without disintegrating into water for prolonged periods, especially when transporting oil) will absorb the oil instead of the oil spilling into the water. Polypropylene

can absorb 3-10 times its own weight without disintegrating, depending on the density of the oil and the size of the polypropylene sheet. Magnetite particles will be embedded in the polypropylene sheet. Magnetite (which costs about 6,000 rupees per tonne) particles bind to oil harmlessly, making the oil temporarily attracted to magnets. This magnetically attracted oil is then attracted using an external magnet, leaving the pad dry for reuse. This cycle can be repeated up to 5 times.

Mechanism: (Ship Overturns):

Large pads will also be kept stored on ships, to be deployed quickly in case of a ship overturn, causing a large oil spill. These will have to be calculated on how long to be kept before saturation beforehand.

Execution & Future Planning:

Polypropylene is a semi-plastic material, which is why extreme care needs to be taken when disposing, and the correct time to dispose of a sheet of polypropylene. To ensure there are no microplastics contributed due to the project, we must:

- Change the polypropylene sheet before complete saturation. Do not use one sheet beyond 5 cycles.

- Dispose of the polypropylene sheet by energy recovery, where it is heated and the energy is recovered. This is completely sustainable.

Scalability:

This project is highly scalable because it uses exciting materials at a reasonable price, with easy-to-execute ideas to solve a global issue

Citations:

1) TEDx Talks. (2016b, January 27). *How to clean up an oil spill –magnetise the oil first | Arden Warner | TEDxNaperville* [Video]. YouTube. https://www.youtube.com/watch?v=LV9209axVUs

2) Wikipedia contributors. (2025b, September 14). *Superabsorbent polymer*. Wikipedia. http://en.wikipedia.org/wiki/Superabsorbent_polymer#:~:text=A%20superabsorbent%20polymer%20(SAP)%20(,softer%20and%20stickier%20gel%20formation.

3) Team, N. (2025, September 17). *Know how a napkin pad is made*. Niir Project Consultancy Services. https://www.niir.org/blog/what-is-napkin-pad-how-a-pad-is-made-a-complete-guide/

4) Wikipedia contributors. (2025d, October 12). *Polypropylene*. Wikipedia. https://en.wikipedia.org/wiki/Polypropylene