OIL SPILL CLEANUP

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ABSTRACT

Oil left in the ocean can have detrimental effects on the health of marine life and the overall ecosystem. Currently, there has not been a solidified solution when it comes to effectively cleaning up oil in the ocean. We chose to test the efficacy of a sorbent, tire powder that has oleophilic properties, in cleaning up oil. Multiple trials were run with different amounts of tire powder to determine if the tire powder was absorbing oil. Based on the results we saw an increasing linear relationship between oil absorption and the amount of tire powder used. We also observed a certain amount of water being absorbed by the bag holding the tire powder.

INTRODUCTION

Our project uses tire powder as a more efficient and eco-friendly alternative to current oil spill clean-up methods. Current methods include dispersion, skimming, burning, and sorbents and are usually used in conjunction with a boom structure. These methods are not as efficient for clean-up because they only remove about 5% of the oil and the rest removed is water. They are also not reusable and don't have an eco-friendly way to dispose of them, and most of the time end up in landfills. We believe that tire powder is a good alternative to the other methods because it is oleophilic meaning that the powder will absorb much more oil than water and has the ability to be reused many times, creating less waste within our landfills.

METHODS

1 SET UP

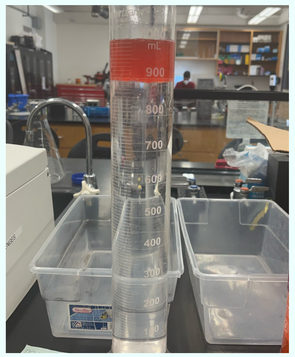
1) 900 mL of water and 100 mL of oil were measured using a graduated cylinder and poured into a container
2) Appropriate amount of tire powder was measured using an analytical balance and poured into the bags

Figure 1. Trials

2 TRIALS

1) The bags were placed into the buckets and left for roughly 5 hours

Figure 2. Measurement of oil and water after 5 hours



3 COLLECTING DATA

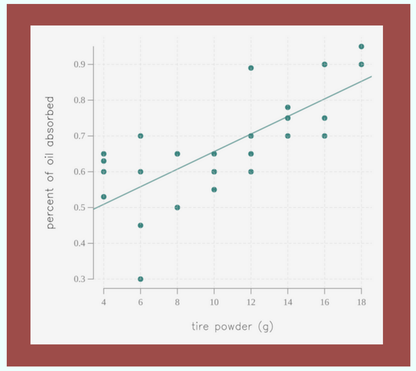
1) Bag with tire powder was removed from the container and the contents of the container were poured back into the large graduated cylinder
2) The amount of water and oil left was recorded
3) Percent absorbed was calculated

4 CLEANUP

1) Empty tire powder from bags into trash
2) Wash cylinder, bags, and buckets with soap to prepare for the next trials.

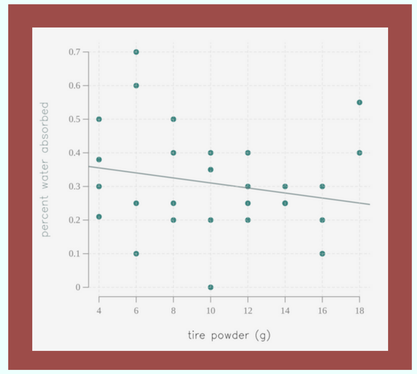
RESULTS

Fiigure 3. Percent Oil Abosrbed vs. Tire Powder(g)



correlation coefficient (r) = 0.73936
coefficient of determination (r-squared) = 0.54666
y = 0.41075 + 0.024549(x)

Figure 4. Percent Water Abosrbed vs. Tire Powder(g)



correlation coefficient (r) = -0.21081
coefficient of determination (r-squared) = 0.044442
y = 0.38506 - 0.0074742(x)

1. There is a **strong positive** linear relationship between **tire powder** and **percent oil absorbed**.
   → The increase in the amount of tire powder results in a larger percentage of oil being absorbed.
2. There is a **weak negative** linear relationship between **tire powder** and **percent water absorbed**.
   → The percent of water absorbed decreases as the amount of tire powder increases.

CONCLUSION

Other researchers have tested the efficacy of tire powder as a sorbent and presented promising results (Lin et al 2008 and Gao et al. 2014). In our experiments, tire powder was confirmed in having the ability to absorb oil. It is able to absorb more amount of oil than water overall, proving it to be an efficient sorbent.

In the future, we would test how to reuse tire powder as Goa et al. proposed they have the capability to be reused (Gao et al. 2014). Figuring out a time and cost-efficient and environmentally friendly way to reuse the tire powder would save a vast amount of resources and money when cleaning up an oil spill.

ACKNOWLEDGEMENTS AND LITERATURE

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Gao Y, Zhou YS, Xiong W, Wang M, Fan L, Rabiee-Golgir H, Jiang Lijia, Hou W, Huang X, Jiang Lan, et al. 2014. Highly Efficient and Recyclable Carbon Soot Sponge for Oil Cleanup. ACS Appl Mater Interfaces. 6(8):5924–5929. doi:10.1021/am500870f.

Lin C, Huang C-L, Shern C-C. 2008. Recycling waste tire powder for the recovery of oil spills. Resour Conserv Recycl. 52(10):1162–1166. doi:10.1016/j.resconrec.2008.06.003.