Ultrasound Remediation of Oil Contaminated Sand in Simulated Wet and Dry Sand Evironments

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Oil spills critically damage the environment. Spilled oil can be removed from water, but oil contaminated sand is dumped into landfills. The oil from the contaminated sand can leach into ground water, creating more damage. Oil contaminated water is sometimes cleaned with detergents, further fouling the water. Oil adsorbs to sand. Mechanically breaking the bond could lead to a better cleaning method. My hypothesis is that ultrasound can be used to mechanically break the oil-sand absorbtion bond. I tested 38kHz ultrasound with 5 ml and 10 ml bar and chain oil, at 5 and 10 minutes, with distilled and 3.4% salt water, on dry and wet sand. 3.4% salt water is the average ocean salinity. I used 3 way ANOVA with interaction to analyze the data. Ultrasound and salt do not significantly affect deabsorbtion individually p=.692. Oil volume significantly deabsorbs p=.001, more oil means more deabsorbtion. Salt and ultrasound significantly interact to increase deabsorbtion p=0.055. Salt and oil significantly interact to increase deabsorbtion p=0.001. Ultrasound and oil significantly interact to increase deabsorbtion at 0.055. Salt, oil and ultrasound interact significantly to increase deabsorbtion p.055. With N=5, p.055 is statistically significant. Dry sand has no measurable deabsorbtion under any test conditions. In conclusion, ultrasound can significantly increase deabsorption of oil to sand and is a viable clean up method in wet and marine conditions. It is not in dry sand environments.

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