

# Ultrasound Remediation of Oil Contaminated Sand in Simulated Wet and Dry Sand Environments

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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 absorption 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 desorption individually  $p=0.692$ . Oil volume significantly desorbs  $p=0.001$ , more oil means more desorption. Salt and ultrasound significantly interact to increase desorption  $p=0.055$ . Salt and oil significantly interact to increase desorption  $p=0.001$ . Ultrasound and oil significantly interact to increase desorption at 0.055. Salt, oil and ultrasound interact significantly to increase desorption  $p=0.055$ . With  $N=5$ ,  $p=0.055$  is statistically significant. Dry sand has no measurable desorption under any test conditions. In conclusion, ultrasound can significantly increase desorption of oil to sand and is a viable clean up method in wet and marine conditions. It is not in dry sand environments.