World Academy of Science, Engineering and Technology
International Journal of Geotechnical and Geological Engineering
Vol:19, No:06, 2025

The Friction Of Oil Contaminated Granular Soils; Experimental Study

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Abstract : Soil contamination is a pressing environmental concern, drawing considerable focus due to its adverse ecological and health outcomes, and the frequent occurrence of contamination incidents in recent years. The interaction between the oil pollutant and the host soil can alter the mechanical properties of the soil in a manner that can crucially affect engineering challenges associated with the stability of soil systems. The geotechnical investigation of contaminated soils has gained momentum since the Gulf War in the 1990s, when a massive amount of oil was spilled into the ocean. Over recent years, various types of soil contaminations have been studied to understand the impact of pollution type, uncovering the mechanical complexity that arises not just from the pollutant type but also from the properties of the host soil and the interplay between them. This complexity is associated with diametrically opposite effects in different soil types. For instance, while certain oils may enhance the frictional properties of cohesive soils, they can reduce the friction in granular soils. This striking difference can be attributed to the different mechanisms at play: physico-chemical interactions predominate in the former case, whereas lubrication effects are more significant in the latter. this study introduces an empirical law designed to quantify the mechanical effect of oil contamination in granular soils, factoring the properties of both the contaminating oil and the host soil. This law is achieved by comprehensive experimental research that spans a wide array of oil types and soils with unique configurations and morphologies. By integrating these diverse data points, our law facilitates accurate predictions of how oil contamination modifies the frictional characteristics of general granular soils.

Keywords : contaminated soils, lubrication, friction, granular media
Conference Title : ICSMGE 2025 : International Conference on Soil Mechanics and Geotechnical Engineering
Conference Location : Barcelona, Spain
Conference Dates : June 10-11, 2025