

Studying the Simultaneous Effect of Petroleum and DDT Pollution on the Geotechnical Characteristics of Sands

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Abstract : DDT and petroleum contamination in coastal sand alters the physical and mechanical properties of contaminated soils. This article aims to understand the effects of DDT pollution on the geotechnical characteristics of sand groups, including sand, silty sand, and clay sand. First, the studies conducted on the topic of the article will be reviewed. In the initial stage of the tests, this article deals with the identification of the used sands (sand, silty sand, clay sand) by FTIR, μ -XRF and SEM methods. Then, the geotechnical characteristics of these sand groups, including density, permeability, shear strength, compaction, and plasticity, are investigated using a sand cone, head permeability test, Vane shear test, strain gauge penetrometer, and plastic limit test. Sand groups are artificially contaminated with petroleum substances with 1, 2, 4, 8, 10, 12% by weight. In a separate experiment, amounts of 2, 4, 8, 12, 16, 20 mg/liter of DDT were added to the sand groups. Geotechnical characteristics and identification analysis are performed on the contaminated samples. In the final tests, the mentioned amounts of oil pollution and DDT are simultaneously added to the sand groups, and identification and measurement processes are carried out. The results of the tests showed that petroleum contamination had reduced the optimal moisture content, permeability, and plasticity of all samples. Except silty sand's plasticity, which petroleum increased it by 1-4% and decreased it by 8-12%. The dry density of sand and clay sand increased, but that of silty sand decreased. Also, the shear strength of sand and silty sand increased, but that of clay sand decreased. DDT contamination increased the maximum dry density and decreased the permeability of all samples. It also reduced the optimum moisture content of the sand. The shear resistance of silty sand and clayey sand decreased, and plasticity of clayey sand increased, and silty sand decreased. The simultaneous effect of petroleum and DDT pollution on the maximum dry density of sand and clayey sand has been synergistic, on the plasticity of clayey sand and silty sand, there has been antagonism. This process has caused antagonism of optimal sand content, shear strength of silty sand and clay sand. In other cases, the effect of synergy or antagonism is not observed.

Keywords : DDT contamination, geotechnical characteristics, petroleum contamination, sand

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