

Geotechnical behavior of oil-contaminated fine-grained soils

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Abstract: Humans are, unintentionally or intentionally contaminating soils from different sources. The contaminated soils are not only a challenge for the environmentalists but also for the geotechnical engineers. When contaminated by crude oil, the soil is subjected to a change in its engineering properties. The soil, which is mostly affected by its environment, is clay, being active electro-chemically. So, a comprehensive laboratory-testing program was carried out to compare the engineering properties of an uncontaminated and a contaminated clay. The research was mainly carried out at King Fahd University, Dhahran, while some behavioral aspects were reevaluated at National Institute of Transportation, Risalpur. Laboratory tests included all basic and advanced geotechnical tests along with Scanning Electron Microscope (SEM). Crude oil was chosen as the contaminant. The clay samples were taken from the Al-Qatif area of the Eastern province of Saudi Arabia. The selected soil is considered to be highly expansive in nature. The comparison between uncontaminated and crude oil-contaminated clay showed that there would be a significant change in the engineering behavior of the clay if it were contaminated by crude oil. The contaminated clay behaves more like a cohesionless material, owing to the formation of agglomerates. The coarse-grained soil-like behavior was obvious in the strength behavior of the oil-contaminated clay. The contamination has affected the plasticity and the cation exchange capacity (CEC) of the investigated clay. The swelling pressure of the clay after contamination suffered three times reduction, while no change was observed in the percent swelling of the contaminated clay.