



The Effect of Lining Material on the Permeability of Clayey Soil

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Abstract

The main objectives of current work are to reduce the permeability of clayey soil for different fluid (water and crude oil) and to predict its efficiency for petroleum storage. Current research uses a sodium bentonite (B) with percentage (1.5, 3 and 6%) by the dry weight of soil and coal tar extended epoxy resin coating as the lining material. The soil sample was brought from AL -Nahrawan region. Soil's permeability for petrol was studied through using compacted soil model and making a central hole (core) in it with changing its dimensions (diameter, thickness of wall and base), type of fluid and number of filling cycles. After filling the core with these fluids, the volume losses of fluids were measured per day. When two cycles were finished, a sample was taken from the base of the core to be examined in a consolidation test. Number of laboratory tests have been conducted such as (Atterberg limits, compaction test, consolidation, sieve analysis and specific gravity). The results showed that the increase in bentonite percentage causes an increase in (optimum moisture content, Atterberg limit and specific gravity) and also decreasing in (max dry unit weight and permeability) as the fluid was water. However, an increase in permeability was obtained using the crude oil. A reduction in volume losses was observed when using the lining material, coal tar extended epoxy resin coating.

Keywords: Permeability; Compacted Clay Liner; Crude Oil; Bentonite; Lining Material (Coal Tar Extended Epoxy Resin Coating (Nitocote ET-402)).

1. Introduction

Environmental damage is usually the result of accidental spills and sometimes deliberate disposal of oil or oily wastes into water or land, through bursts of pipes and pumps, erosion of pipelines and spillage during transport [1]. Soil and groundwater contamination with petroleum components can result from small leaks to large ruptures in underground storage tanks (USTs), which represent broad public environmental and health concerns [2, 3].

Crude oil contains a complex mixture of compounds, mainly hydrocarbons. The constituents of crude oil are grouped into four major categories, the saturated compounds, the aromatics, the resins, and the asphaltenes [4]. The main environmental concern associated with crude oil is that it can pose serious risks to human health and the earth's ecology during all stages of production, processing and consumption, if not handled carefully [3, 5].

Soil permeability is considered a key parameter in many hydrological and geotechnical problems so, environmental concerns have led researchers to focus their attention on the hydraulic conductivity of clays, due to their important role in waste containment [6].

The compact clay liner is one of the most important components of municipal landfills used to prevent the infiltration of pollutants into groundwater resources. Compressed clay soil is generally considered impervious. Even with the

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