

Evaluation of Geotechnical Properties of Crude Oil contamination Lateritic Soils in Iyana Ejigbo Lagos, Nigeria

Olowofoyeku, Adeoye¹, Ofuyatan Olatokunbo², Fakeye Kolade¹

¹Department of Civil Engineering, Yaba College of Technology, Lagos, Nigeria

²Department of building Caleb University Lagos. Nigeria.

Corresponding author toksofuya@yahoo.com

Abstract: This study evaluated the geotechnical properties of lateritic soil in, Southwestern Nigeria. Short term studies on the influence of crude oil spillage on lateritic soil were performed for some weeks. Two samples of lateritic soil were investigated, samples A and B (uncontaminated and contaminated). Soil sample B contained 10% by weight (2kg) of crude oil. Sieve analysis, Atterberg limits, compaction test, California bearing ratio test (CBR), Consolidation test and shear strength tests were performed for a period of 84 days. This test was carried out in accordance with British standard code of practice (BS1377:1990). Contaminated soil was prepared by adding total of crude oil (2kg) on the sample already sieved and measured (20kg) by weight of the dry soil sample and mixed until a uniform mixture was obtained. The classification results showed that crude oil contamination caused an increase in liquid limit and plastic limit between days of contaminations. The compaction result showed that there was an increase in maximum dry density while the optimum moisture content decreased between 7days and 84days of crude oil contamination. The result showed that there was a decrease in the cohesion value and the frictional angle due to the introduction of the crude oil into the soil. Although crude oil altered the geotechnical properties of the lateritic soil and reduced its strength, the soil can still be used for geotechnical purposed after remediation. [Olowofoyeku, Adeoye; Ofuyatan Olatokunbo; Fakeye Kolade. **Evaluation of Geotechnical Properties of Crude Oil contamination Lateritic Soils in Iyana Ejigbo Lagos, Nigeria.** *Academ Arena* 2015;7(12):1-2]. (ISSN 1553-992X). <http://www.sciencepub.net/academia>. 1. doi:[10.7537/marsaaj071215.01](https://doi.org/10.7537/marsaaj071215.01).

Keywords: Lateritic soil, Oil spills, Contamination, geotechnical properties

1.0 Introduction

Lateritic soils are the most common reddish colour weathered pathogenic surface deposits occurring in the tropical and subtropical regions of the world. They constitute the most common materials for the construction of earth dams, highways, embankments, airfields as well as foundation materials to support structures in these areas. (Gidigas, 1976). Their chemical composition and morphological characteristics are influenced by the level of weathering of which the parent material has been subjected to (Gidigas, 1976). It is therefore almost impossible to execute any construction work in Nigeria without the use of lateritic soils (Osinubi, 1998). The definition of laterite which had wide acceptance among authors state that laterite is a highly weathered material, rich in secondary oxides of iron, aluminum, or both. It is void or nearly void of bases primary silicates, but it may contain large amounts of quartz and kaolinite" (Alexandra and Cady, 1962

Crude oil is a naturally occurring liquid mineral deposited beneath the earth surface. It's brought to the earth surface from the source of production (Oil wells) to the terminal through pipelines of various sizes. Its occurrence is most times accompanied with the existence of natural gas and formation water on the earth crust. Crude oil is toxic, due to its toxic chemical content and radioactive content, specifically the

presence of Uranium and Thorium. These radionuclide's and members of their decay chains are found in the earth's crust and therefore become incorporated into the crude oil during the process of oil drilling and production OGP. These Petroleum if not properly handle can spill into the environment during production and when accidents occur in refinery, oil storage facility, barges, oil tankers or oil pipelines and it can affect the environment radio logically. Oil spillage has been described as a major source of water and land pollution in the Niger Delta region and the increase in its frequency has been attributed to the growth of the industry and the prevalence of ageing oil pipelines. Oil spill could be caused by vandalism or as a result of equipment failure. Crude oil spill affects plants negatively by creating conditions which make essential nutrients like nitrogen, oxygen etc needed for plant growth unavailable due to the spillage on the soil. The aim of this research is to determine geotechnical properties of lateritic soil in Lagos, Ejigbo Oshodi-Isolo local Government area, Southwestern NigeriaThe result will give an insight to the level of damage that oil spill has done to the fertility and nutrient status of the community farmland.

1.2 Materials and Method

Lateritic soils samples were collected from Iyana Ejigbo, Isolo in Lagos state, South-western part of

Nigeria. Laboratory tests were conducted on the samples were Atterberg limits test, specific gravity test, compaction test, california bearing capacity test, consolidation test and shear strength. The samples were oven-dried to minimum moisture content. All the tests were carried out in accordance with British standard code of practice (BS1377:1990). Soil samples (10kg) were collected from different locations, samples of lateritic soils taken at the deepest infiltration of the oil contaminants. The air dried sample was sieved with 4.75mm BS sieve to remove dirt and particles leaving behind well graded samples of lateritic suitable for the tests which was then stored temporary inside an air tight container to avoid further moisture absorption. About 20kg of the sieved sample of lateritic soil was thoroughly mixed with 2kg (2.5 litres representing 10% degree of contamination) of crude oil as pollutant for 40 minutes. The contaminated sample was then stored inside a container.

The amount of contaminant was calculated by weight of the dry uncontaminated soils and then mixed with the predetermined weight of the dry test samples. Water was mixed thoroughly for the test. The samples were conveyed to the laboratory and the following tests carried out on them.

3.0 Results And Discussion

Results of the various tests carried out in order to investigate the influence of crude oil spillage on the lateritic soil are presented below and discussed accordingly.

Properties of the crude oil and chemical composition of the soil.

The crude oil used has its specific gravity at 15.55°C to be 0.841 and the American Petroleum Institute (API) gravity is between 15.55°C and 36.8 degree API. The soil sample used for this study consists.

References

1. Aboaba, O.A., Aboaba, O.O., Nwachukwu, N.C., Chukwu, E.E. And Nwachukwu, S. C.U. Evaluation Of Bioremediation Of Agricultural Soils Polluted With Crude Oil By Planting Beans Seeds, *Phaseolus Vulgaris*. [Nature and Science. 2007;5 (4):53-60].
http://www.sciencepub.net/nature/0504/09_0323_ABOABA_EVALUATION_ns0504.pdf.
2. [Ikhimiukor, O.O., Nneji, L.M. The Review of the Use of Microorganisms in the Biodegradation of Crude Oil Spill. *Researcher*, 2013,5(12):155-163].(ISSN: 1553-9865).
<http://www.sciencepub.net/researcher>.

12/8/2015