

Evaluation of Drainage in Sub-grade Using Morphological Techniques

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ABSTRACT

Onshore and offshore spills contaminate soil. This basically takes place due to exploration of oil, transportation, production and processing leakage of diesel products from oil tankers, spills due to vehicular accidents, from pipelines buried in ground. In addition to environmental concerns for ground water pollution, oil contamination brings adverse effect on basic geotechnical properties of foundation soil. Thus main aim of the study was to discover the influence of oil contaminated sandy soil on the lateral behavior of pile groups embedded in oil contaminated sand by changing thickness of oil contamination layers, by changing the oil contents for contamination and by changing the type of oils (Mobil & Diesel) For matching the field conditions, contaminated sand layers was prepared by mixing the sand with oil content 0-5% with regard to dry soil. Small scale test model tests were performed on various - pile groups .Further for investigating angle of internal friction various direct shear tests were done in laboratory. It is apparent from test results that lateral load that on contaminating not only depend upon contaminated thickness and content of oil but also depend upon the type of oil through which soil get contaminated

LITERATURE REVIEW

Review of the literature is an essential part before attacking for an appropriate solution. Through the review of literature, one can understand what has already been done, what the grey area to be studied and how best the problem could be addressed. So a comprehensive literature review is presented under following heads:

Poulos and Davis(1980),Tomlinson(1994) stated that when pile is subjected to static compressive loading the deformation increases at a rapid rate.

E . C . Shin ,J. B. Lee and B. M. Das (1998) evaluate the shear strength by varying the crude oil % from 0 to 4.2.They find out that with decrease in soil friction angle with oil contamination the ultimate bearing capacity also decreased. When the oil content increases from 0 to 1.3% the ultimate bearing capacity reduced by 75%.

Direct shear test performed on oil-contaminated sand shows a reduction in soil friction angle with an increase in oil percentages (Ghaly, 2001)

Nasr (2013) stated that uplift resistance of a vertical pile was decrease by contamination

Dr.Solly George , Aswathy EA .Berlin Sabu , Krishnaprabha NP , Maria George (2014-15)investigate the geotechnical properties of engine oil-contaminated sandy soil by varying the percentage of oil from 0%,4%,8%and 12% of dried weight of samples. They state that oil contamination decreases the liquid limit and plastic limit but unconfined compressive strength increases and the MDD value is found to be decreasing and whereas value of OMC was increasing .They indicate that CBR value for 4% diesel was higher than that of un contaminated soil while for 8% and 12% it got reduced.

Gbenga Matthew AYININUOLA and Oluwatosin Feyisetan KWASHIMA(2015) carried out the study of effect of diesel oil contamination on soil permeability .They find out that depending on degree of level of contamination , soil permeability decreases with time for soil not exposed to the atmosphere and it has been seen that if soil is exposed to atmosphere its permeability firstly decreases upto a point than it start increasing.

A. M. A. Nasr and S. V. Krishna Rao(2016) performed small scale model test on single pile and pile groups and he carried out investigation by varying the percentage of oil content , the thickness of oil contaminated layer and the pile group configuration. He made contaminated sand by adding the % of oil from 0 to 6% of dry weight of sand and state the lateral capacity ratio (LCR) and pile group efficiency () decreases with increase of contamination And maximum bending moment for middle pile in the lead row in the group is generally increases with increase in contamination. He state that maximum bending moment along the pile length increases by 40% at an oil content and 2% over that in clean sand. They stated that for pile groups embedded in oil-contaminated sand only pile group configuration mainly affected the pile group efficiency.

Mahdi Karkush (2016) performed the experiment on clay by contaminating with synthetically with industrial waste water of 10%.20%,40%,and 100% and find out that vertical displacement of pile cam increases from 5.5% to26.6% as contamination increases and lateral resistance of pile group decreases by 5.5% to 26.6% .

When the sand get contaminated with oil, due to lubricating effect the contacts of sand grains have reduced the shear strength of the mix (Rao, 2016)

II.METHODOLOGY

Tests are conducted in laboratory having a rectangular flume of 60cm width, 90cm height and 12m length. The flume has transparent perspex sheet on both sides of walls. The flume is fed by a pump delivering discharge up to 30 l/s. Water entered in flume through head box. The upstream entry of the flume is equipped with a metal screen ensuring uniform flow conditions. The test section was reduced in width to $W=0.4m$ with a sufficiently long parallel approach flow reach. Two longitudinal guide walls provided to allow water supply to be uniform when approaching the weir on the whole flume height. The longitudinal guide walls having 2m length and 40cm width between walls used to install piano weir. A platform of height 30cm from the base of flume and of width 40cm was made to install piano key weir over it. The platform was installed at 6m from water entering head box. A cippolleti weir of crest length 30 cm installed at the end of the flume to measure discharge passing through piano key weir.

The upstream piezometric head (H) data were determined using the point gauge with minimum accuracy of 1mm above 1m upstream from piano key weir crest. Another point gauge used to measure head over cipolletti crest at the end of the flume. Water was allowed to enter from a water tank and conveyed to flume through a pipe.

III.CONCLUSIONS

The following conclusions can be obtained from the experimental study:

- Impedance value decreases with increase in the water head over the surface of the filter.
- Impedance value increases with increase in sediment load i.e. increase in the concentration of clay because greater concentration of clay offers more resistance to flow.
- Higher percentage of algae offers higher resistance to the flow. Similarly, clay and algae mixed water offers even more resistance than clay mixed water having same concentration.
- R^2 for best fitted curve obtained is 0.9249 using Multiple Linear Regression.

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