ISSN (Online): 2456-0448
International Journal Of Innovative Research In Management, Engineering And Technology
Vol. 3, Issue 1, January 2017

EFFECT OF CEMENT ON THE STRENGTH BEHAVIOUR OF SOIL –GLYCEROL MIXTURE

[1] Ashima R. Suresh, [2] Tanuja Christopher D'cruz
[1]PG Student, Department Of Civil Engineering, Marian Engineering College, Tvm.

[2] Professor, Department Of Civil Engineering, Marian Engineering College, Tvm.

Abstract: . Ground pollution arises from the impact of past and current industrial activity and due to improper disposal of waste generated by society. In this paper ,it is concentrated on the behaviour of soil mixed using glycerol, which is a major constituent and by-product of industries. Attempts to understand the soil response to glycerol, its changes with various concentration of pollutant. The study continues by asessing the effects of various amounts of cement-soil mixture with various percentage of glycerol. The glycerol- soil samples were prepared with different percentages of a glycerol solution with 40% concentration. The results showed that the UCS strength decreased with the increase in glycerol perentage

Keywords: Contaminated soil, Glycerol, Soil -cement .

I. INTRODUCTION

1.1 General

Improving the mechanical behavior of clay soils by stabilization is a means of fulfilling geotechnical design criteria. The methods of stabilization can be divided into chemical and mechanical techniques. Chemical stabilization includes the addition of additives such as lime, cement, and fly ash to the soil. These chemical agents cause chemical reactions to occur in the soil water that stabilizes the soil.

Soil can be contaminated by organic materials attributable to leakage from underground or aboveground storage tanks and accidental spills. The response of soil to the contaminants not only depends on the local environment but it is also influenced by factors such as particle size, bonding characteristics among particles, and ion exchange capacity. The transport of contaminant components from soil into groundwater can cause serious problems. Stabilization of contaminated soil can be achieved by adding agents such as fly ash, lime, and cement, or a combination of them. The stabilization of contaminated soil is usually performed to prevent from contaminant transport to groundwater, to reduce the mobility of the contaminant in soil, or to change the contaminant into a nontoxic form. This procedure is called stabilization and solidification of contaminated soil.The ultimate aim of this method is to reduce the concentration of contaminant in soil

The use of contaminated soil and its stabilization can be considered in earthworks such as embankments, backfills, and roads if there is no pathway for leaching of contaminants to underground water or if the contaminants pose no risk to the public and the environment. In some areas the native soil is contaminated with hydrocarbon substances. For performing projects in such areas, because of the haulage distance to suitable soil and economic considerations, often the use of local soil is dictated for construction. Thus, the treatment and stabilization of local soil must be considered. On the other hand, in some areas where the soil has been contaminated and the treatment is not economic, for the design of a project in these areas the effect of the contaminating substance on the soil behavior should be evaluated. Therefore, understanding the mechanical behavior of contaminated soils and their treatment is important.

II. MATERIALS AND METHODOLOGY

2.1 Materials

Materials used in this study are Low plastic soil, glycerol and cement.

2.1.1 Soil. Low plastic clay for the present study was collected from Thonnakkal. Various tests were conducted for determining the index properties of low plastic clay.

Table 1: Properties of Kaolinite

Properties	Values
Specific gravity	2.63
Liquid limit (%) (IS 2720 PART 51985)	44
Plastic limit (%) (IS 2720 PART 51985)	10.757
Plastic index (%) (IS 2720 PART 51985)	17.819
Shrinkage limit (%) (IS 2720 PART 51985)	20.98
IS Classification	CL
Natural moisture content (%)	26.48
Optimum moisture content (%) (IS 2720 PART 7)	26.58
Maximum dry density (g/cc) (IS 2720 PART 7)	0.970
Percentage of clay (IS 2720 PART 4)	71
Percentage of silt (IS 2720 PART 4)	20
Percentage of sand (IS 2720 PART 4)	9
UCC strength (kg/cm^2) (IS 2720 PART 10)	1.940
Shear strength	0.970

IJIRMET ISSN (Online): 2456-0448
International Journal Of Innovative Research In Management, Engineering And Technology
Vol. 4, Issue 1, January 2019

Fig. 1. Kaolinite clay

2.1.2 Glycerol. Glycerol was considered as the contaminating organic material. Glycerol (propane-1,2,3-triol) is an oxygenated organic compound that has been successfully and widely used in the chemical industry in the last decades. Major applications of glycerol can be found in the detergents industry as well as in drug and pharmaceutical production. In this work, a solution of glycerol with a concentration of 40% was used.

Table 2: Properties of Glycerol

PROPERTIES	VALUES
Assay(ex-density)(%)	98
Wt. per ml at 20 degree C	1.255-1.260
Ash content(%)	.02
20% Aq. Solution	Neutral – litmus
Chloride(%)	0.001
Sulphate(%)	0.001
Lead(%)	0.0005

2.2 METHODOLOGY

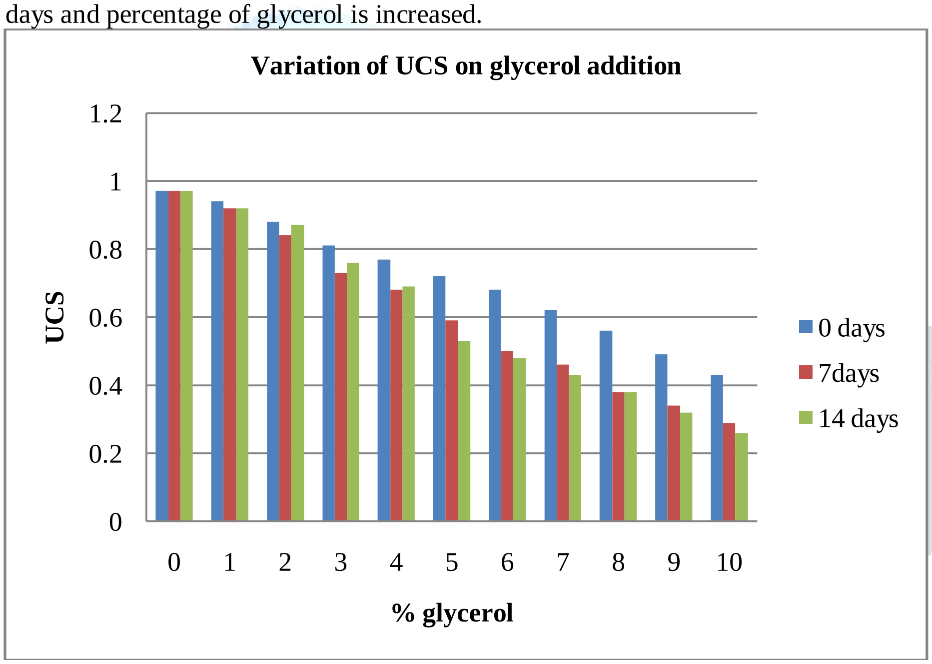
2.2.1 The samples that were used consisted of natural soil, soil-cement, soil contaminated with glycerol, and soil contaminated with cement. In preparation of the samples contaminated with glycerol, the degree of contamination was specified as the percentage weight of contaminant with respect to mixture of air-dried soil with contaminant. The degrees of contamination of 1% and 2% were considered for preparing the contaminated samples.

The calculated weight of glycerol with 40% concentration with degrees of contamination of 1% and 2% was sprayed on 8 kg of soil.The soil was poured in flat layers with thickness of about 50 mm in a tray. A prespecified volume of fluid was sprayed on each layer and mixing was done carefully. The soil was then flattened and the next layer with the same thickness was added on it, and spraying and mixing was repeated. This procedure was repeated until the last layer. After that, all layers were mixed and covered with a nylon to prevent from evaporation. y. The mixture was then kept in sealed plastic bags for one week so that the soil and glycerol came to an equilibrium condition. Standard compaction tests were conducted on these mixtures. . The maximum dry unit weight and optimum water content were determined for each of the materials.The samples for the UCS were prepared at their respective optimum water content that were obtained from a standard compaction test.

3 RESULTS

3.1 EFFECT OF GLYCEROL ON LOW PLASTIC CLAY

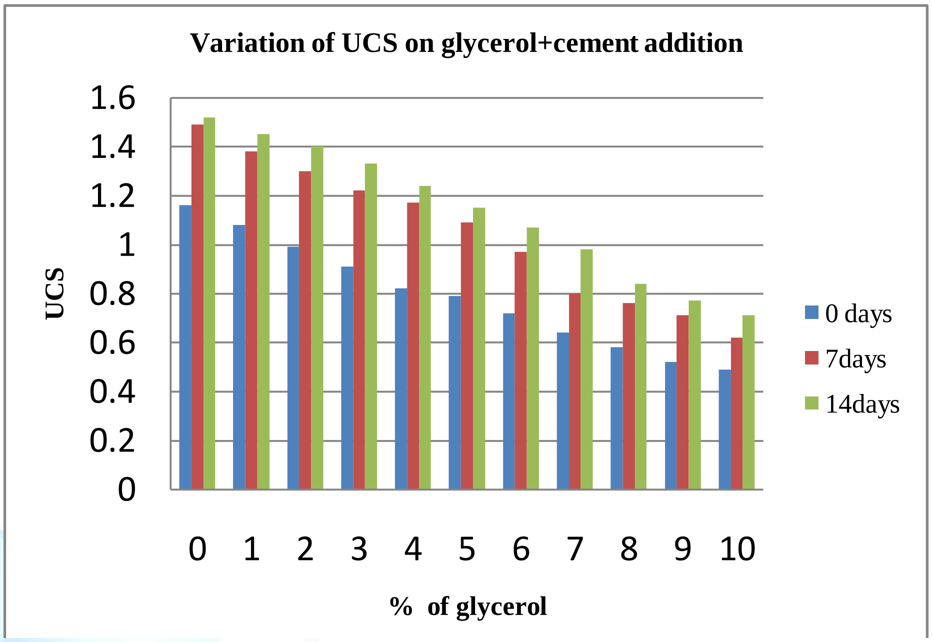
On adding glycerol, the UCS value of low plastic clay showed a decrement. This decrement is greater when the number of curing days and percentage of glycerol is increased.



3.2 EFFECT OF CEMENT ON SOIL-GLYCEROL MIX

On adding cement on glycerol added soil, the UCS value of low plastic clay showed anincrement. This increment is greater when the number of curing days and percentage of cement is increased.

IJIRMET ISSN (Online): 2456-0448
International Journal Of Innovative Research In Management, Engineering And Technology
Vol. 4, Issue 1, January 2019



4 CONCLUSIONS

Based on study and experimental investigation following conclusions were drawn

I. It was observed that with the addition of glycerol in low plastic soil, the unconfined compressive strength (UCS) values of the soil glycerol mixture decreases.
II. Theunconfined compressive strength (UCS) decreases as number of days of curing increases.
III. It was also observed that with the addition of6%cementon glycerol mixed soil,the U.C.S value increases.
IV. The maximum increment in U.C.S is shown for 14 days curing and also at 6% glycerol

References

1. Auber J.E. and Barber M.G. (2012), The effect of hardening of clayey soil blocks during freezing and thawing cycles, IJCIET,Vol.16, No.4

2 .Estabragh R., I.Beiytolahpour, M.Moradi and A.A.Javadi (2014), Consolidation behavior of two fine grained soils contaminated by glycerol and ethanol, Journal of materials in civil engineering, Vol.12, No.3

3. Estabragh R.,M. Khatibi and A.A.Javadi (2016), Effect of cement on soil contaminated using glycerol, Journal of materials in civil engineering, Vol.28, No.4

4. Fa-xing Huang and Hai-jun Lu (2014), "Experiment Study on the Atterberg Limits of Clay Contaminated by Oil", EJGE, Vol. 19

5. Cetin H.,Fener M. and Gunaydin O. (2006), The geo technical properties of tire-cohesive clayey soil mixtures as a fill material, Geotechnical Testing Journal, Vol.88, No.7,pp.110-120

6. Obaid M. F.(2014), The influence of organic solutes on the geotechnical properties of extremely plastic clayey soils, Ijciet, Vol.3, No.7, pp. 83-91

7. Ratnaveera P. and Meegoda(2006), Shear strength and stress-strain behavior of contaminated soils, Geotechnical Testing Journal, Vol.29, No.2,pp.133-140

8. Ugwu E.l.,Ekeleme A.C.,Awoyera P.O, Ozioko H.U. and Osinachi (2018), Effect of municipal solid waste contamination on some geotechnical properties of soil, Journal of material and environmental science, Vol.9, No.2,pp585-590

9. J.Olufowobi, A.ogundoju, B. Michael, O.Aderinlewo(2014),Clay soil stabilisation using powdered glass, Journal of Engineering Science and Technology, Vol.9,No.5,pp.541-558

10. S. Sasanian and T.A. Newson(2014), The basic parameters governing the behaviour of cement treated clays,Journal of Soils and Foundation , Vol.54, No.2,pp.209-224

11. D. H. Solomon and H. H. Murray(1972),Acid–Base interactions and the properties of Kaolinite in non-aqueous media,Journal of clay and clay, minerals ,Vol.20

12. Murat Olgun and Mustafa Yildiz(2010),Effect of organic fluids on the geotechnical behaviour of a highly plastic clayey soil ,Journal of clay and clay mineralsVol.48, No.4,pp.615-621

13. Ashraf K. Nazir(2011),Effect of motor oil contamination on geotechnical properties of over consolidated clay, Alexandria engineering Journal, Vol.50, pp.331-335

14. LIU Zhi-bin, LIU Song-yu, and CAI Yi(2015),Engineering property test of kaolin clay contaminated by diesel oil,Journal of central south university,Vol.22, pp.4837-4843

15. Yan-Jun Dua, Suksun Horpibulsukb, Ming-Li Wei, Cherdsak Suksiripattanapong, Martin D. Liu(2014),Modeling compression behavior of cement-treated zinc-contaminated clayey soils,Journals of soils and foundation, Vol.54, No.5, pp.1018-1026

16. S. Sasaniana and T.A. Newson(2014), Basic parameters governing the behaviour of cement-treated clays,Journals of soils and foundation, Vol.54, No.2,pp.209-224

17. Daniel Ribeiro, Raquel Néri, and Rafaela Cardoso(2016),Influence of Water Content in the UCS of Soil-Cement Mixtures for Different Cement Dosages ,ICTG, Vol.143,pp.59-66

18. Suphat Chummuneera and Peerapong Jitsangiam (2016),Permanent Deformation Behavior of a CementModified Base Course Material,ICTG, Vol.143, pp.42-50

19. Takashi Tsuchida and Yi Xin Tang(2015) ,Estimation of compressive strength of cement-treated marine clays with different initial water contents ,Journal of soils and foundation, Vol.55,No.2,pp.359-374

20. Anjali S Nair and Joe G Philip(2013),Effect of pH Variation of Pore Fluid on The Geotechnical Properties of Fly Ash Stabilized Clay, IJSR, Vol.5, No.9

21. Unyime Edet John (2010),Chemical performance of cement stabilised contaminated clay ,Geotechnical Testing Journal , Vol.54,pp.324-3319

22. Chun-YangYin, Hilmi BinMahmud, and Ghazaly Shaaban(2006), Stabilization/ solidification of lead-contaminated soil using cement and rice husk ash, Journal of hazardous material, Vol.137, No.3,pp.467-471

23. Amitdyuti Sengupta (2007), Solidification and Stabilization of Contaminated Soil, Journal of science and environmental engineering, Vol.74, No.2,pp.871-875