An Overview: TO Reduce Swelling Potential of Expansive Soil by Using Polypropylene Material

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Abstract – A series of tests were performed to examine the effect of induced nano-composites on behaviors of the expansive clay. Tests were carried out at different polymer contents and curing time. The induced nano-composites within the swelling clay can be attributed to non-plastic properties and acted as a hydraulic binder with lesser swelling potential.

Keywords- Expansive Soil, Nano-Composites, Xylene (Ortho)

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1. INTRODUCTION

The problems associated with expansive soil are related to bearing capacity and cracking, breaking up of pavements, and various other building foundation problems. Such soils are common in India. The present paper deals with the properties of expansive soils of Maharashtra, India at various locations. The effect of polypropylene on swelling is studied and it is found that swelling decreases with addition of polypropylene. Effect on dry density and water content is also presented. Finally multiple suggestions are given to overcome the swelling of expansive soils by different means including using polypropylene.

For all engineering structures constructed on expansive soils, these soils create swelling when they are come in contact with water and shrink once water is squeezed out. These volumetric changes cause considerable failure to the foundation and damage to the civil structures. The types of structure that are damaged are foundations, retaining walls, pavements, etc. Extensive geotechnical investigations have been carried out to study the swelling clay improvement for foundation uses and to control volume changes. There are many methods of stabilizing soil to gain required engineering specifications.

EXPERIMENT:

Properties Of Tested Soil Sample

Property	Value
Specific Gravity	1.8
Initial Water Content (%)	22.95
Liquid Limit (%)	87.5
Plasticity Index (%)	51.79
Max. Dry Density (KN/m3)	2.4

Procedure for Preparation of Polypropylene Clay Composite: The clay was dried in an oven at temperature 105-110oc for 24 hours. The clay was accurately weighted. The quantity of ortho xylene added in 1000 ml beaker with proportion 1:4 (1 part of polypropylene and 4 parts of xylene). After hearing process solution of (xylene+polypropylene) was added into the soil sample mix thoroughly placed at different curing time.

TESTING PROGRAM

The variation of polymer content with

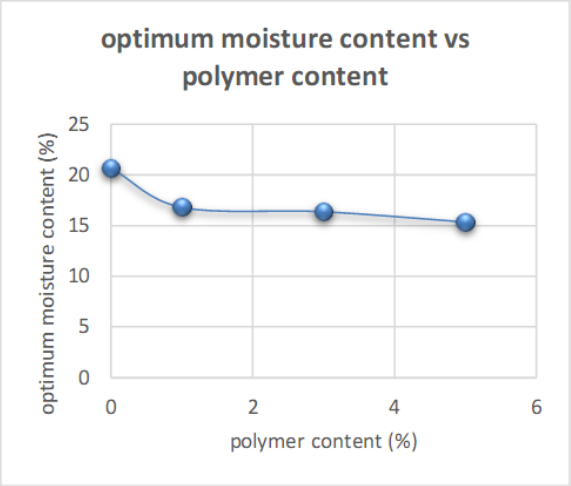
i. Plasticity index

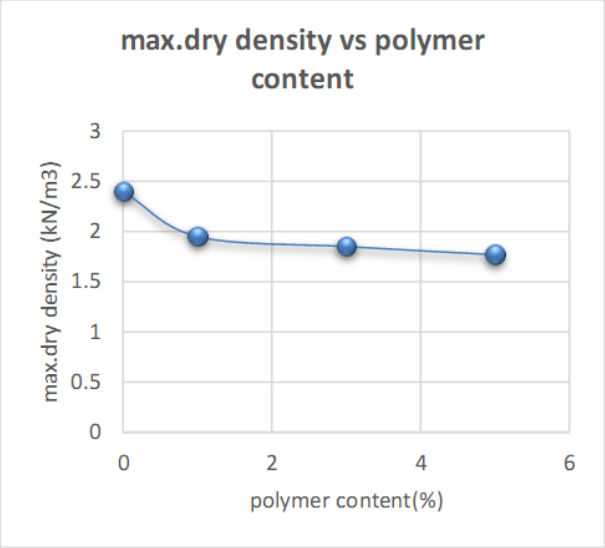
ii. Optimum Moisture Content

iii. Max. dry Density

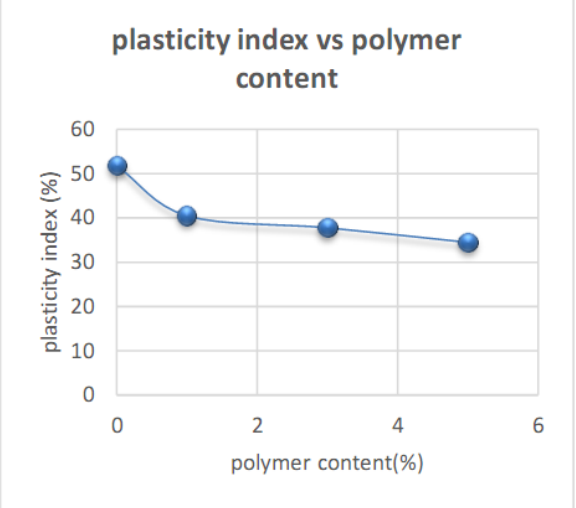
iv. Unconfined compression strength

The addition of polymer to form nano composite material with clay decreases dry density and optimum moisture content with increasing the polymer content (1 %,3%,5%).

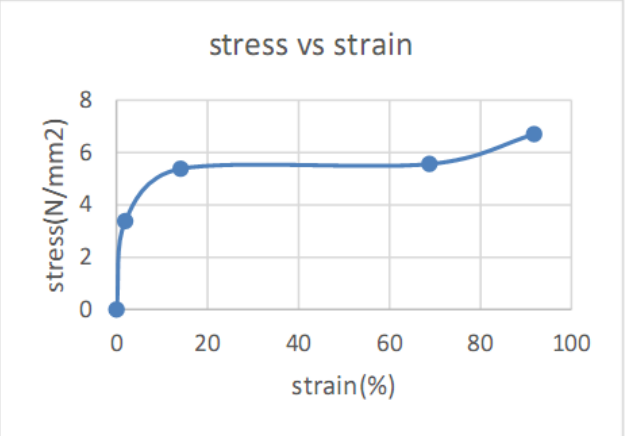




It is found that the induced nano-composites had a great effect on decreasing the plasticity index. This reduction was due to the absorption of excess water during the interaction between the clay and polymer through ion change reaction.



The unconfined compressive strength of stabilized soils in relation to curing time, for the entire polymer content increases more rapidly with the increase of the curing time. Increasing the nano-composites size can increase the shear strength.



CONCLUSION:

The general conclusion drawn from above study of polypropylene material as follows.

1. The increasing polymer contents of nano composite sizes reduce swelling potential of soil.

2. As polymer content increases plasticity index and free swell deceases gradually.

ACKNOWLEDGEMENT:

We would like to thank our Principal of institute Prof. Dr. D. D. Shah, HOD Civil Department Prof. Dr. A. W. Dhawale and Prof. Y. K .Poul co-operative guidance, all faculty members and all our dear friends for their support.

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