International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue 12
April 2018

Improvement Of Cohesive Strength Of Local Clay Using Geotextile By Sandwich Technology

GNANAGURU.K
PG Student, Department of Civil Engineering, PRIST University,
Thanjavur, Tamil Nadu, India.

ABSTRACT

Geotextiles have been used very successfully in road construction for over 30 years. Their primary function is to separate the sub base from the subgrade resulting in a stronger road construction. The geotextile performs this function by providing a dense mass of fibers at the interface of the two layers. It is suggested that the ability of a geotextile to act as a separator is largely independent of the mechanical characteristic of the geotextile and that strain softening geotextiles can still perform this role when strained past their peak values. A strain energy approach to design is not routine in geotechnical engineering design, as it is difficult to quantify the external energy supplied to the system and the internal energies of the individual components making up the construction. Recent research has suggested that an equivalence of strain energy, between different geotextile types, may exist up to the in service strain. Comparing the actual strain energy and that calculated using a simplified approach shows that significant errors are introduced by firstly ignoring the nonlinear characteristics of the stress-strain curve and secondly by not considering the entire area under the stress-strain curve to rupture of the geotextile. Based on the difficultly in using the strain energy approach in geotechnical engineering design and the significant inconsistencies that can exist in its calculation, it is suggested that the concept of strain energy is not an appropriate parameter for characterising geotextiles.

INTRODUCTION

Geotextiles have proven to be among the most versatile and cost-effective ground modification materials. Their use has expanded rapidly into nearly all areas of civil, geotechnical, environmental, coastal, and hydraulic engineering. They form the major component of the field of geosynthetics, the others being geogrids, geomembranes and geocomposites. The ASTM defines geotextiles as permeable textile materials used in contact with soil, rock, earth or any other geotechnical related material as an integral part of civil engineering project, structure, or system. Based on their structure and the manufacturing technique, geotextiles may be broadly classified into woven and nonwoven. Woven geotextiles are manufactured by the interlacement of warp and weft yarns, which may be of spun, multifilament, fibrillated or of slit film. Nonwoven geotextiles are manufactured through a process of mechanical

interlocking or thermal bonding of fibers/filaments.

Mechanical interlocking of the fibers/filaments is achieved through a process called "needle punching". Needle-punched nonwoven geotextiles are best suited for a wide variety of civil engineering applications and are the most widely used type of geotextile in the world. Interlocking of the fibers/filaments could also be achieved through "thermal bonding". Heat-bonded geotextiles should be used with caution, as they are not suitable for filtration applications or road stabilization applications over soft soils.

RAW MATERIAL OF GEOTEXTILE

The four main polymer families most widely used as the raw material for geotextiles are:

1. Polyester
2. Polyamide
3. Polypropylene
4. Polyethylene

The oldest of these is polyethylene, which was discovered in 1931 in the research laboratories of the ICI. Another group of polymers with a long production history is the polyamide family, the first of which was discovered in 1935.The next oldest of the four main polymer families relevant to geotextile manufacture is polyester which was first announced in 1941. The most recent polymer family relevant to geotextiles to be developed was polypropylene, which was discovered in 1954.

THE BASIC PROPERTIES OF GEOTEXTILE

The properties of polymer material are affected by its average molecular weight (MW) and its statistical distribution. Increasing the average MW results in increasing:

- tensile strength
- elongation
- impact strength
- stress crack resistance
- heat resistance

TYPES OF GEO TEXTILES

- woven geo-textiles
- Non-woven geo-textiles
- Knitted geo-textiles

Geo Textiles are the largest group of geo synthetics in terms of volume and are used in geo technical engineering, heavy construction, building and pavement construction, hydrogeology, environment engineering.

Woven Geo-Textiles

A fabric or synthetic material placed between the soil and a pipe, gabion or retaining wall; to enhance water movement and retard soil movement and act as a blanket to add reinforcement and separation." Coastal works, water ways, embankments and in forming. Geocell for road.

Fig.1 Woven geo-textiles on concrete basis

Non-Woven Geo-Textiles

Filtration, drainage, reinforcement between soil stone or aggregate and in roads, railways works, erosion prevention and separation. As filter fabric for dams, under drainage system liners for pile foundation, coated PVC and bitumens to skin traction.

Fig.2 Non-woven geo-textiles in filtration

Knitted Geo-Textiles

Knitted bags for protection of dam's riverbank etc. Warp knitted fabric of Kevlar yarns used in automobile and marine application. It is also used with foundations, soil, rock, earth or any other related material as an integral part of human man made project, structure or system.

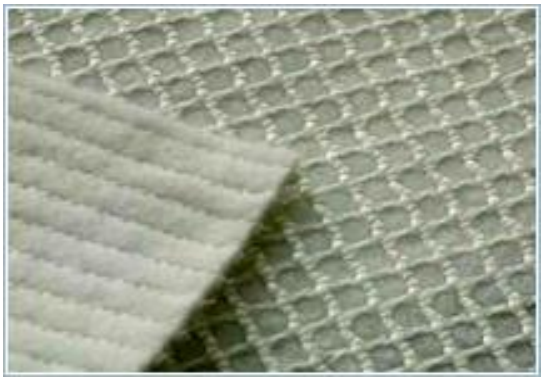

Fig.3 Reinforcement knitted geo-textiles

FUNCTIONS OF GEOTEXTILE

The mode of operation of a geotextile in any application is defined by six discrete functions:

- Separation
- Filtration
- Drainage
- Reinforcement
- Sealing
- Protection.

Depending on the application the geotextile performs one or more of these functions simultaneously. The protection function is not discussed here as it is not related to transportation applications.

APPLICATIONS OF GEOTEXTILE

Geotextiles are extensively utilized in the following applications:

- Road construction, airstrips and runways
- Railway track construction
- Pipeline foundation and protection
- Drainage and lowering of ground water
- Coastal protection
- Pavement overlays

- Ponds and canals
- Roofing systems
- Waste containment systems

ADVANTAGES OF GEOTEXTILES

Space Savings - Geotextiles occupy significantly less volume than comparable soil and aggregate layers.

Material Quality Control - Geotextiles are manufactured under controlled factory conditions which minimize material variation, while soil and aggregate are proportioned at batch plants.

Construction Quality Control - Geotextiles require limited connections, while soil and aggregate layers are actually constructed in place and therefore are subject to variations caused by weather, handling and placement.

Cost Effectiveness - Geotextiles are less expensive to purchase, transport and install that soils and aggregates.

Technical Superiority - Geotextiles have been engineered for optimum performance, including greater strength, drainage efficiency and clogging resistance than soils and aggregates

CBR VALUE USING GEOTEXTILES (for 5 mm penetration)

Table 1 presents the CBR value of soil using Geotextiles.

Table 1: CBR Value using Geotextiles

Sl.No	Type	CBR value (%)			Average CBR value (%)
		Trail-1	Trail-2	Trail-3	
1	SC soil (clay mixed sandy soil)	12	13	11	12
2	SC soil strengthened with single layer of geotextiles	16	15	17	16
3	SC soil strengthened with double layer of geotextiles	25	24	27	25

From the observed results, it can be concluded that CBR value increased due to strengthening of soils with geotextiles.

CONCLUSION

Geotextiles are effective tools in the hands of the civil engineer that have proved to solve a myriad of geotechnical problems. With the availability of variety of products with differing characteristics, the design engineer needs to be aware of not only the application possibilities but also more specifically the reason why he is using the geotextile and the governing geotextile functional properties to satisfy these functions. Design and selection of geotextiles based on sound engineering principles will serve the long-term interest of both the user and the industry.

REFERENCES

1. Robert M. Koerner ‘Designing with Geosynthetics’, 1998
2. http://www.drexel.edu/gri/gmat.html

3. John N.W. M ' Geotextile ',
4. TANFEL Advertisement report 1990
5. http://www.geofabrics.com.au/bidim.htm#filtration
6. http://www.geofabrics.com.au/bidim.htm#embankment
7. http://www.ag.ohio-state.edu/~ohioline/aex-fact/0304.html
1987
8. http://www.acf-environ.com/stabprod.html.
9. http://www.cofra.com/typar.html
10. www.multigeo.com
11. www.jute-industry.com/jute-textiles/geo-textiles.html
12. 12. N. W. M. John - Technology & Engineering – 1987 "Geotextiles"