IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Review On Geo Textile

Kaviya sri.B[1], Sudharshini.G.M[2], Dr.K.M.Pachiyappan[3], Dr.R.Divya Sathyam[4], Jothi.J[5]

M.Sc. Student[1,2], Dean school of Applied science[3]., Associate Professor[4], Research scholar[5]

Department of Costume Design and Fashion,

PSG College of Arts and Science, Coimbatore.

ABSTRACT:

Geotextiles are designed fabrics that are used to improve soil stabilization, erosion control, and water management in a range of civil engineering, construction, and environmental applications. These textiles, which are usually composed of synthetic fibres like polyester and polypropylene, have several uses, such as soil structure reinforcement, drainage, filtration, and separation. Because they may extend life and save maintenance costs, geotextiles are especially useful in infrastructure projects like building roads, landfills, and coastal protection. By increasing the longevity of construction projects, lowering soil erosion, and promoting better water flow, their use also contributes to sustainable development.

Key Words: Synthetic fibres, filtration, reinforcement, soil stability, drainage, erosion management and sustainable development.

1. INTRODUCTION:

In geo-textiles during the previous 20 years [1]. Geotextiles, or permeable fabrics, are used to lessen erosion and increase the stability of the earth, rock, and soil. They are widely used in construction projects, such as those involving roads, dams, and retaining walls. Adaptable permeable fabrics, or geotextiles, can effectively perform a variety of functions when paired with soil, including filtration, drainage, protection, and separation. Standard weaving machinery can be used to achieve flexibility and porous nature. Non-woven geotextiles are provided for subsurface drainage, erosion management, and road stability for wet moisture-sensitive soils [2]. The two primary types of geotextile textiles are woven, which resembles sacking used for mail bags, and nonwoven, which is more like felt. Geotextile fabrics are typically constructed of polyester or polypropylene. Geotextile composites and products such as geogrids and meshes have been developed. Geosynthetics are a

group of materials that include geoonets, geosynthetic clay liners, geogrids, geotextile tubes, and various combinations. The demand for technical textiles worldwide was 26.58 million tons in 2014 and is projected to expand at a compound annual growth rate (CAGR) of 3.7% from 2015 to 2022, reaching 35.47 million tons.[3,4].The largest class of geosynthetics is comprised of geo-textiles. The primary materials included into these textiles are synthetic fibres. Usually, these man-made fibres are incorporated into pliable, elastic textiles [5].

2. MATERIALS AND METHODOLOGY:

2.1. SOIL: The sample was taken for this project at a depth of one meter below the top surface, close to the BH-1 block, LPU.

2.2. PROPERTIES OF GEOTEXTILES: This project uses woven geotextile that was purchased from "SRAVYA TEXTILES LIMITED" in Hyderabad, Andhra Pradesh. Table 1 lists the various geotextile properties (Woven Geotextile Properties).

2.3. TECHNIQUES: The tests are conducted in accordance with the codes of practice. There are descriptions of the many test kinds listed.

PROPERTY	TEST METHOD	UNIT	300GSM
Tensile strength	IS 1969	KN/M	60
Trapezoidal strength	ASTM D 4533	N	1500
Puncture strength	ASTM D 4833	N	800
Discharge	ASTM D 4491	$L/M^2/S$	18
Apparent opening size	ASTM D 4751	MICRONS	250
Roll width		M	4

Table 1: Woven geotextile properties

The following experiments are carried out during experimentation:

* Analysis of sieves.
* Casagrande's liquid limit gadget.
* Figuring out the plastic limit.
* The proctor test as usual.
* The CBR, or California Bearing Ratio [6].

3. FIBRES USED IN GEO TEXTILES:

3.1. Natural fibres:

Utilized fibres in geotextiles Organic Fibres Natural fibres come from plants, animals, and minerals and are widely available in great quantities all over the world. High strength, high modulus, low breaking extension, and low elasticity are characteristics of natural fibres. Natural fibres have several advantages over synthetic ones when it comes to geotextile production: they are inexpensive, strong, resilient, readily available, have good drape, and are biodegradable [7].The following significant plant fibres can be used to create geotextiles: coir, jute, sisal, flax, hemp, abaca, and ramie. Given that natural fibre-based geotextiles are biodegradable, they may be used especially for temporary purposes. Additionally, the main advantages of using natural fibres in geotextiles are their affordability, robustness, strength and durability, availability, high drapeability, and environmental friendliness and biodegradability.

3.2. Synthetic fibres:

Synthetic or man-made fibres are the main ingredients utilized to create all sorts of geotextiles. Polyester, polyamide, polyethylene, and polypropylene are the four main polymer families that are used as raw ingredients to create geosynthetics polypropylene.

3.3. Polypropylene:

The most common polymer used in the creation of geotextiles is polypropylene because of its inexpensive cost, suitable tensile properties, and chemical inertness. Polypropylene is relatively inexpensive per unit volume due to its low density. The limited resistance of polypropylene to creep and mineral oil, as well as its susceptibility to UV light and high temperatures, are some of its disadvantages. Thus, it is advised to utilize polypropylene-based geotextiles in the proper installation and environmental conditions.

3.4. Polyester:

Another significant polymer used in the creation of geotextiles is polyester, or PET. It is utilized in applications where the geotextile is exposed to high loads and extreme temperatures because of its outstanding creep resistance and tenacity properties. One of polyester's main drawbacks is that it can break down hydrolytically in soils that are acidic.

3.5. Polyamide:

Small amounts of polyamides, such as nylon 6 and nylon 6, are used to make classic geotextiles. It should be emphasized that in addition to creep behavior, other factors like fabric structure, finishing treatments, and the constraining effect of any surrounding soil may also have an impact on their features [8].

4. APPLICATIONS:

1.Roadways	• Highest sile strength in the earth's mass, rovideten. • Let the roadbed to be rapidly dewatered. • Maintains porosity without sacrificing its separation.
2.Railway works	• To divide the soil from the subsoil without affecting the flow of groundwater. • Encircling the material that is straying off to the side and calming it down.
3.River canals and coastal works	• Shields from wave-induced erosion • Reduces the need for Hydrostati cup lift.
4.Drainage	• Agriculture, deep drainage ditches, retaining walls, reservoirs, and earth dams.
5.Sports field construction	• Offers superior strength and long-lasting dimensional stability.
6.Agriculture	• Mudcontrol

Table.2: Application of Geotextile[8].

5. PROPERTIES OF GEOTEXTILES:

5.1. Physical Properties:

- Specific gravity
- Weight and thickness
- Stiffness
- Density

5.2. Mechanical Properties:

- Tenacity
- Tensile strength
- Compatibility
- Flexibility
- Tear strength
- Frictional resistance

5.3. Hydraulic properties:

- Porosity
- Permeability
- Permittivity
- Transitivity
- Soil retention
- Filtration

5.4. Degradation Properties:

- Biodegradation
- Hydrolytic degradation
- Photo degradation
- Chemical degradation
- Mechanical degradation [9].

6. TYPES OF GEO TEXTILES:

The Geo textiles are manufactured in three different categories- woven Geotextiles, non-woven geotextiles and knitted geotextiles.

6.1. Woven geotextiles:

Together Many geo-synthetics are of the woven variety, which can be further categorized into other groups according to how they are made. As their name suggests, they are made by utilizing methods akin to those used in the weaving of traditional apparel textiles. Their distinctive appearance is that of two sets of parallel threads, or yarns: weft is the term for the single beroendicuar yam, and warn is the term for the yam that runs along the length. The majority of low to medium strength woven fabrics are made from polypropylene, which can be found in thin film, extruded tape, monofilament, or multifilament forms. To maximize performance/cost, a variety of yarn types are typically utilized in the warp and weft directions.

Fig.1: Woven Geotextile

6.2. Non-woven Geo textiles:

Geotextiles that aren't woven are created by joining materials. It is accomplished by heat, chemicals, needle punching, and other techniques. Synthetic fibres are mostly used to create them. They are applied as filters and employed in separation. They are appropriate for use in both exterior and interior penetrations of geomembrane lining systems. Non-woven geotextiles are the best option when extracting water is necessary. Depending on their function, non-woven geotextiles are only employed in 5% of cases.

Fig.2: Non-Woven Geotextile

6.3. Knitted geotextiles:

Knitting is a procedure used in the clothing textiles industry to make knitted geosynthetics. This procedure connects a number of yarn loops together. Knitted geotextile output is rather modest. The knitting process is used in conjunction with another way of manufacturing geosynthetics, such as weaving, to make all knitted geotextiles.

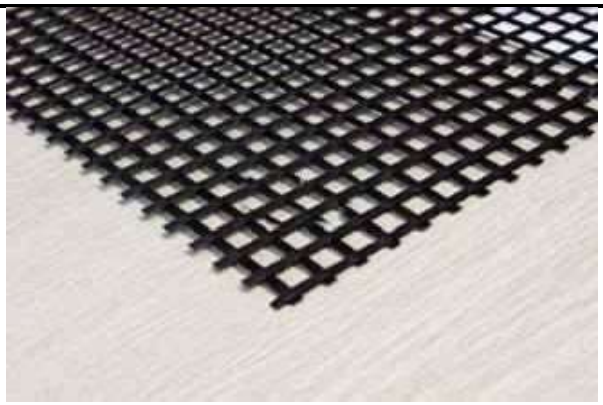


Fig.3: Knitted geotextiles

7. Functions of geotextiles:

A. Seperation:

A common issue in pavements is the intermixing of aggregates between the base and sub-base layer soil because of the impending load, which promotes deformation. The mechanical traits and qualities of two soils with varying particle sizes and behaviors are maintained by geotextiles. such separation is defined as, "The introduction of a flexible porous textile placed between dissimilar materials so that the integrity and the functioning of both the materials can remain intact or be improved" . The use of geotextiles to keep two neighboring soils from mixing is referred to as separation in this context. For example, the geotextile maintains the strength and drainage properties of the aggregate material by keeping the fine subgrade soil apart from the base course aggregates.

B. Filtration:

The passage of water across the plane is called filtration. By establishing an auto filter with the natural soil, the geo-textile functions as a filter and corrects the hydraulic equilibrium. But as water seeps out of the soil, it ought to regulate—if not entirely eliminate—the quantity of particles that migrate into the drainage media. For a wide range of civil engineering applications, the geotextiles ensure consistent and continuous drainage performance by holding onto the filtration strata and preventing the washing out of smaller particles.

C. Drainage:

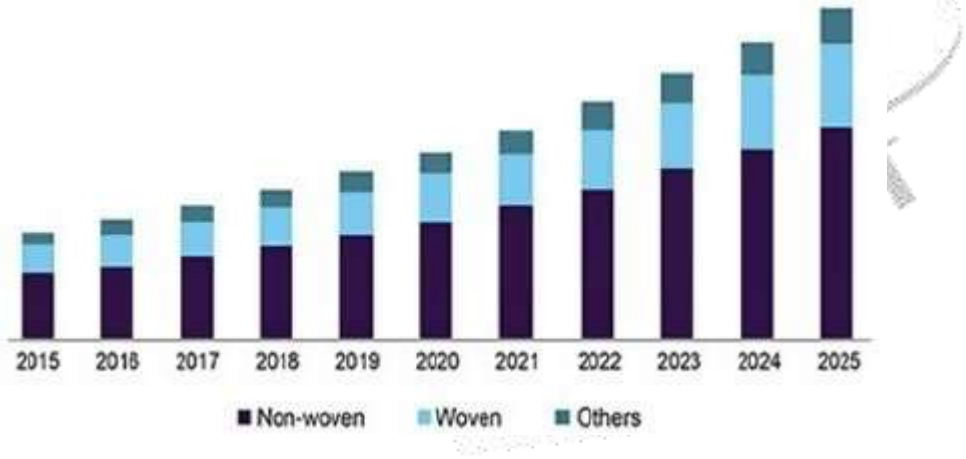
The flow of water along the plane is known as drainage. A geo-textile has the ability to gather liquids or gases and move them along a plane of its own. resulting in transmission that is fluid. The thick, highly porous drain known as geo-textile makes it easier to assess the amount of water in its plane and release pore pressures. Even when heavily compressed, it maintains its adequate thickness, high transmissibility, and high horizontal permeability. With their high void ratio, geotextiles work with the natural soil to create an autofilter that stops internal crosion and prevents uplift.

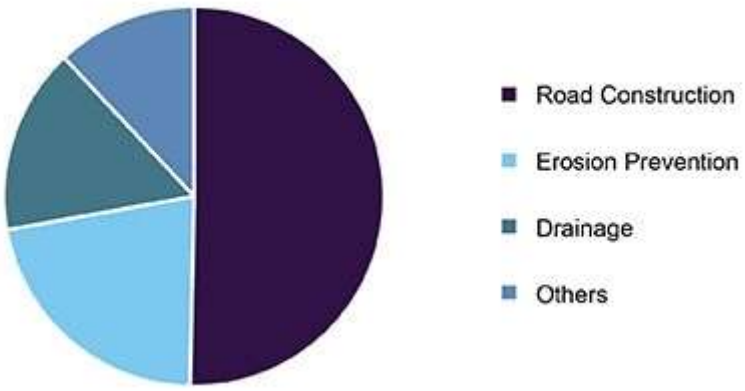
D. Reinforcement:

This is the overall increase in system strength that results from incorporating a geotextile into a soil. In this process, the material's tensile strength improves the soil's structural stability. This idea is the same as using steel to reinforce concrete. Reinforcing steel is used to strengthen concrete since it is fragile under tension. Similar to reinforcing steel, geo-textiles work by offering strength that aids in keeping soil in place. The roads can be constructed over extremely weak soils because to the reinforcement that geotextiles give.

8. RESULT AND DISCUSSION:

Depending on the kind, geo-textiles—which are frequently used for drainage, erosion control, and soil stabilization—perform differently. Because of their exceptional strength and low permeability, woven geotextiles are a good choice for heavy-duty applications like roads that require reinforcing. On the other hand, non-woven geotextiles that possess more porosity are superior in terms of filtration and drainage. Though this effect varies by fabric, clogging tends to lessen over time as finer particles fill the pores. The length of the project and environmental considerations determine the geotextile material to employ: synthetic materials are preferred for long-term use, while biodegradable choices are better suited for short-term or environmentally sensitive projects. According to a cost-benefit analysis, non-woven geotextiles provide a more affordable option for temporary needs whereas woven geotextiles can lower long-term upkeep.





9. Conclusion:

Geo-textiles have been observed to be a successful approach to address sub-grade soil issues in roads. By extending the life of a pavement, geotextiles improve the qualities of the subsoil. People should be made fully aware of the applications of geo-textiles. One of the many products in the wider family known as geosynthetics is geo-textiles. Geo-textiles are knitted, nonwoven, or woven textile materials that are permeable. With a diversity of polymeric compositions and architectures, geo-textiles can be used for a multitude of purposes. However, there is still much to learn about the potential of geotextiles, necessitating further study in this area.

10. References:

[1].Button JW. Overlay construction and performance using Geo-textiles. Transportation Research Record 1248, TRB. Washington DC; National Research Council; 1989. p. 24–33.

[2].Standard specifications for Geo-textiles. Available from: https://www.usfabricsinc.com/specifications/aashto

[3].Horrocks, A. R., & Anand, S. C.Handbook of Technical Textiles. Woodhead Publishing Ltd, (2000).

[4].Cambridge, England. http://www.grandviewresearch.com/press-release/global-technical-textiles-market (Access date:13/10/2017)

[5].Richardson GN. An installation of geo-grids and their role in paved roads and associates. Washington: Geo-Synthetic Materials Association; 1998 Jul. p. 46.

[6].Waseem Akram & Kommareddy Sarath Chandra Reddy, (2016).Usage of woven Geo-textiles in the construction of subgrade in flexible pavements. Indian journal of science and technology. ISSN: 0974-6846, Vol 9(44). DOI:10.17485/2016.

[7].Nizam EH, Das SC (2014) Geotextile- A Tremendous Invention of Geo technical Engineering. International Journal of Advanced Structures and Geotechnical Engineering 3(3): 221-227.

[8].John,N.W.M. Geotextiles. Blackie and sons, Glasgow, Scotland.(1987).

[9].E.Sanjana, Mohammed Mujeeb (2022).International Journal for Advanced Research In Science & Technology. A Peer Reviewed International Journal. ISSN: 2457-0362. VOL:12.

[10].Jaladhi Chitaria & Jitendrasinh Raol, (2019). Application Of Geo-Textiles In Road Construction. GRD Journals. ISSN: 2455-5703.