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GEOSYNTHETICS UTILIZATION IN ROAD CONSTRUCTION

O. I. Mashchenko, student,
T. V. Skrypnik, Candidate of Engineerings Sciences, Docent,
N. A. Chekhlan, lecturer
Automobile Highway Engineering Institute of
State Higher Educational Establishment
«Donetsk National Technical University»

Abstract. *The paper discusses the typical geosynthetics utilization in road construction. It focuses on major advantages of the geosynthetic products.*

Key words: *maintenance, geotextile, soil, engineering problems, costs.*

ВИКОРИСТАННЯ ГЕОСИТЕТИЧНИХ МАТЕРІАЛІВ У БУДІВНИЦТВІ ДОРІГ

О. І. Мащенко, студент,
Т. В. Скрипник, канд. техн. н., доцент,
Н. О. Чехлань, асистент
Автомобільно-дорожній інститут
державного вищого навчального закладу
«Донецький національний технічний університет»

Анотація. *Обговорюється типове застосування геосинтетичних матеріалів у будівництві доріг, основна увага приділяється головним перевагам продукції з геосинтетичних матеріалів.*

Ключові слова: *технічне обслуговування, геотекстиль, ґрунт, інженерні задачі, витрати.*

Road construction and maintenance in Ukraine is one of the greatest problems of the state. Because of short durability of the road pavement, unreliable asphalting and low quality of the road-building Ukrainian government has to invest large amounts of money on a regular basis. Utilization of modern materials in road construction allows to enhance the quality of the roadway covering, to reduce the number of constructions and to improve the road capacity. Geosynthetics is a type of innovative materials to create additional layers in roads for armoring, drainage, protection, filtration, and waterproofing, thermal protection. They are known as geotextile materials, geonets, geogrids, geocomposits, geomembranes. Utilization

of geosynthetics in Ukraine can save the most of the budget allocated for road construction and about 40% of building materials (like stone, ground).

Geosynthetic materials have been increasingly used in geotechnical and environmental developments over the past 40 years. For many years these products help designers and contractors to solve some types of engineering problems where the use of conventional building materials is restricted or much more expensive. There is a significant number of geosynthetic materials and geosynthetic applications in geotechnical and environmental developments.

The general types of geosynthetics are used for soil reinforcement including geotextiles (particularly woven geotextile), geogrids and geonets. Geotextiles are continuous woven, nonwoven, knitted sheets or stitches of bound fibers. Sheets are flexible and permeable. They usually take the form of fabric. Geogrids have an evenly distributed array of holes between longitudinal and transverse elements. These holes give a direct contact between soil particles on both sides of the sheet. Geonets are relatively thick, three-dimensional networks constructed from the strips of a polymeric sheet. Strips are joined together to form interconnected cells filled with soil and sometimes concrete. In some cases polyofine geogrid strips of 0.5 m - 1m wide linked together with vertical polymeric rods are used to form deep geogrid layers called geomattresses. [1]

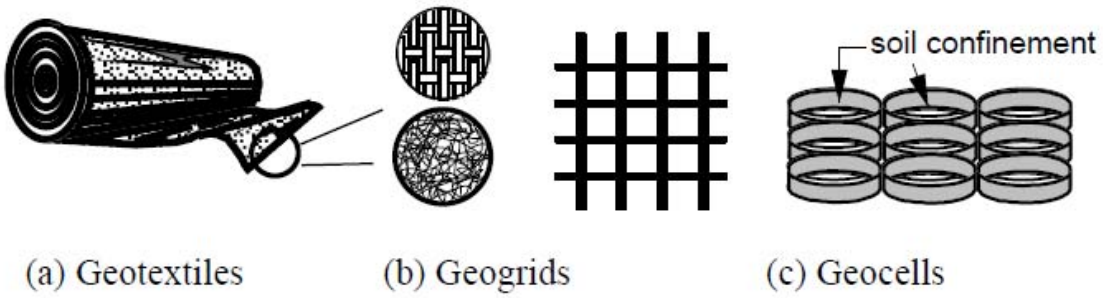

Fig. 1. Geosynthetics commonly used for soil reinforcement

Often the remedy for soft or wet soil conditions is to resurface the soil with the addition of gravel. But, unless the subsoil can restrain the loads of the livestock and vehicles, the gravel is eventually mixed with the subsoil and the most of the gravel advantages are lost.

Geotextile materials can be used on the soil, prior to the distribution of gravel, for the soil and gravel separation. In this case two functions of the geotextile are used:

1. Separation of soil layers (gravel and the underlying soft soil)
2. Stabilization of the soil subgrade (ensures the load on the gravel surface)

The improved load carrying capacity achieved by a single layer of the geotextile can be compared with how snowshoes support a person on the soft snow. It distributes the load over a large area and limits it on the subsoil, as shown on Figure 2. The larger thickness of the gravel layer itself can provide the same result, but the layer thickness can be reduced using the geotextile. In most cases the savings from thickness reduction of the gravel layer will meet or exceed the cost of the geotextile. In addition, the useful life of the gravel surface should be significantly increased. [2]

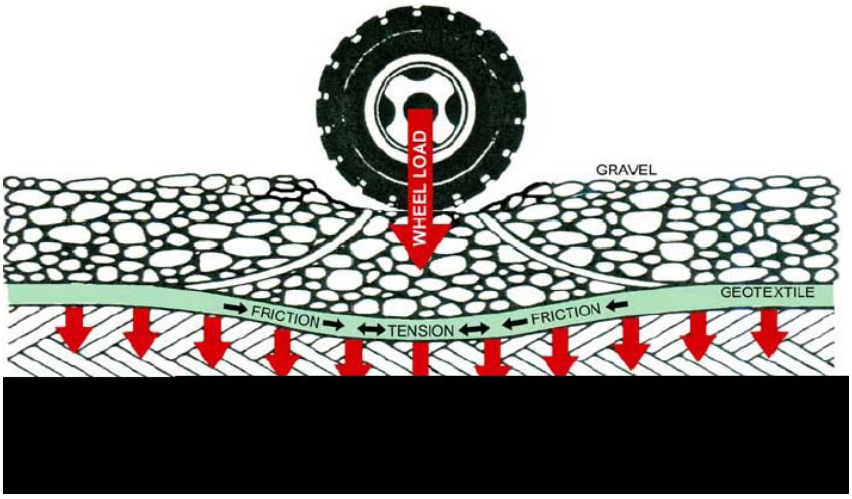

Fig. 2.How a geotextile acts to separate and stabilize soil on a roadway

Geosynthetics have great potential to be used as cost-beneficial solutions of some engineering problems. This paper presents recent advantages of geosynthetic

products, the utilization of these materials in soil reinforced concrete structures and in environmental protection. Manufacturing of geosynthetic products allows to include recent advances in the material science. Thereby, it is expected that innovations in products, their types and properties will be in progress expanding the already vast range of these materials application.

Geosynthetic reinforced soil retaining walls present better performance than traditional retaining walls under dynamic loading. It is demonstrated by a number of prototype structures that withstood severe earthquakes. Thus, this type of structures can be cost-beneficial not only under static loading but also in regions where significant seismic activities are expected. New construction methodologies have also broadened the applications of geosynthetic reinforced soil retaining wall. They have reduced the construction time, costs and allowed better aesthetic conditions for the final structure.

The utilization of the geosynthetics has also led to major advances in environmental applications.

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