

Geotextiles: An Overview of Applications

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Engineering problems may require 'hard' solutions, i.e. constructed facilities having one or more load bearing members, or 'soft' solutions where no load-bearing members are required. Geotextiles are gaining ground in applications in Civil Engineering; particularly in applications where 'soft' engineering solutions are required.

Geotextiles are basically textile materials adapted for use in a soil-intensive environment. They may be natural or synthetic, permeable or impermeable, and their thickness may be in a wide variety of scales. In their varied forms and natures, they may be used for a wide variety of uses, some of which are identified below.

Jute geotextiles, being biodegradable, are ideally suited for guarding slopes against waves in coastal and estuarine environments. The objective here is not to have a slope greater than the angle of repose, it is rather to protect a slope which is constructed at the angle of repose of the soil from degeneration due to waves lapping on it. Over time, the geotextile will be degraded by biological agents but the slope will be permanently protected by the turf growing on it. The geotextile will be permeable, unless coated with such chemicals as will make it impermeable.

In another context, if a point source of groundwater contamination can be identified, the contamination can be contained in a pre-defined zone by using very thin impermeable synthetic geotextiles. This will prevent the contamination from spreading into the groundwater at large. This can be an effective way of isolating the soil in industrial areas from its surroundings. In a certain industry in eastern India, it has been found that the discharge of an effluent into the soil has led to the presence of an abnormally high amount of a cation in the soil which has polluted the drinking water supply in the neighbouring areas. If the effluent is discharged into soil isolated from its surroundings by synthetic geotextiles, then the drinking water in the adjacent areas will not be contaminated. Over time, the soil into which the effluent is discharged will be highly enriched in that particular cation which may then be extracted for some productive use.

Synthetic geotextiles, thin and impermeable, may also be used in hydraulic structures like barrages as impervious seals. They may also be spread on or under the rip-rap typically placed downstream of a barrage to extend the impervious apron by a little greater amount. Should it be desired, they may also be spread over or under a partial area of the rip-rap. In fact, the rigid concrete apron may be shortened drastically and replaced by a sandwich-type construction with impermeable membranes under and on top of a rip-rap layer.

Membrane-like impervious geotextiles can also be used to provide waterproofing solutions. Whether on rooftops, including but not limited to, over expansion joints between two parts of a structure having large lateral dimensions, impervious membranes provide cost-effective waterproofing solutions.

Stronger geotextiles, not necessarily impervious, can be used in conjunction with boulders to protect erosion-prone banks of rivers. Erosion is very common on the concave banks of river meanders leading to meander migration with attendant problems. Boulders piled on the concave side, either in a loose manner or tied by large-meshed wire nets into 'sausages', are commonly used for protection against erosion. These boulders can be wrapped in high-strength geotextiles also to form 'sausages'.

Geotextiles may also be used to reinforce earth and find use in landscaping, particularly in multi-levelled gardens.

Impermeable membranes can also be used in conjunction with retaining walls for the purpose of waterproofing. Box foundations can be effectively waterproofed by such membranes. Such membranes may also find applications in tunnels including for underground railway systems.

Geotextiles can be developed still further in terms of variations in chemical composition, mechanical strength and permeability. New chemical compositions and composite geotextiles, consisting of two or more layers, may be tried. It is possible to have one layer giving strength and another making the geotextile impermeable. The bonding between different layers needs to be given great importance in such cases.

Geotextiles hold out great possibilities. Though they are already being used to quite an extent, space exists for them to be used even more and for more innovative uses.

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