

# Geosynthetics Engineering



Mr. Tee Choon Heng

In the 1970s, geotextiles (geosynthetics) were largely ignored by geotechnical engineers who thought the only supplier of geotechnical materials was GOD. However, the abundantly available natural soil is sometimes far from being an ideal construction engineering material. In general, soil is inherently weak in tension, shear and can be compressible with poor drainage property. Adding geosynthetics to soil would convert it into a composite material with enhanced properties.

Since the 1980s, geotextiles have progressively pervaded all branches of geotechnical engineering. This may yet be one of the most important revolutions to date in the history of geotechnical engineering.

## DEFINITION

Geosynthetics are defined as “planar products manufactured from polymeric material used with soil, rock, earth, or other geotechnical engineering related material as an integral part of a man-made product, structure or system” – ASTM Committee D35 (1984).

Geosynthetics can be formed by manufacturing processes such as extrusion, spinning, stretching, weaving and bonding. Typically, they are composed of one or more of polymers such as polyethylene (PE), polypropylene (PP), polyesters (PET), polyamide/Nylon (PA), polyvinyl chloride (PVC), Polyvinyl Alcohol (PVA), Polystyrene (PS). Geosynthetics may also be combined with carbon fibre, glass fibre, natural fibre materials and other materials such as bentonite.

In Geotechnical Engineering applications, geosynthetics can be used to separate materials, reinforce soil, permit drainage, provide filtration or act as impermeable barrier. Types of geosynthetics and their key functions are listed below:

- Geotextiles - drainage, filtration, separation, protection.
- Geogrids - reinforcement, stabilisation.
- Geomembranes - fluid barrier, liner.
- Geonets – drainage.



Types of Geosynthetics

- Geofabric - lightweight fills, insulation.
- Geocomposites - liner, combination of functions.
- Electrokinetic geosynthetics – incorporates electrokinetics to traditional functions.

Geosynthetics are being used extensively in geotechnical, transportation, environmental and hydraulic engineering as well as to provide technically efficient, cost effective, environment-friendly and/or energy-efficient solutions to a wide range of civil engineering problems. Hand in hand, rational design methods are now available, based on sound engineering concepts and standardised testing methods

to determine engineering properties to geosynthetics and geosynthetics engineered composites.

Geosynthetics Engineering is fast gaining prominence worldwide to deal with the application of scientific principles and methods to the acquisition, interpretation and use of knowledge of geosynthetic products for the solution to geotechnical, transportation, environmental, hydraulic and other civil-engineering-related problems.

## GEOSYNTHETICS IN MALAYSIA

Introducing any state-of-the-art technology to the local industry is never an easy task. It is particularly

challenging in the absence of specific codes of practice for such new technology or product. The new technology may have gained acceptance worldwide, but the local industry will still demand a local case history to be convinced. This is a chicken-and-egg situation. If it is not accepted in the first instance, there cannot be a local case history!

In the case of the first application of geogrid in Malaysia, the late Professor Chin Fung Kee took a bold step when he designed and introduced the application of geogrids in the Jitra-Butterworth Expressway in 1985. This small proactive action would eventually be a big step in the development of Geosynthetics Engineering in Malaysia. Since then, the achievements using geosynthetics material in engineering practice in Malaysia has been impressive.

IEM has organised many conferences, workshops and lectures to promote and develop the applications of geosynthetics here. These include:

- Symposium on Application of Geosynthetic and Geofibre in Southeast Asia (1989).
- Workshop on Geotextile Design and Applications (1992).
- 2nd Asian Geosynthetics Conference (2000).

On the international front, the International Geosynthetics Society (IGS) is dedicated to the scientific and engineering development of geotextiles, geomembranes, related products and associated technologies. (More at [www.geosyntheticsociety.org](http://www.geosyntheticsociety.org)).

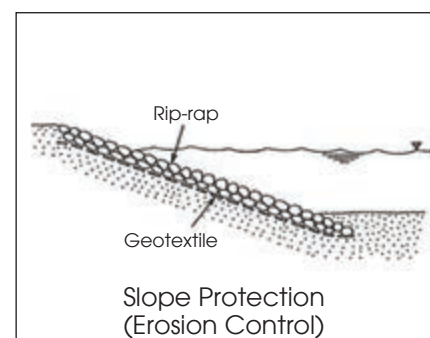
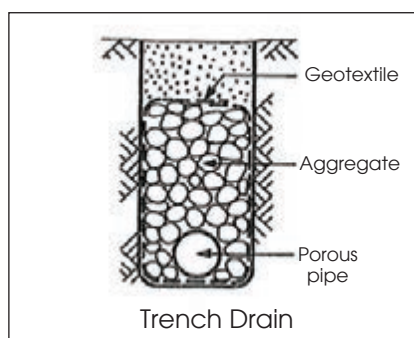
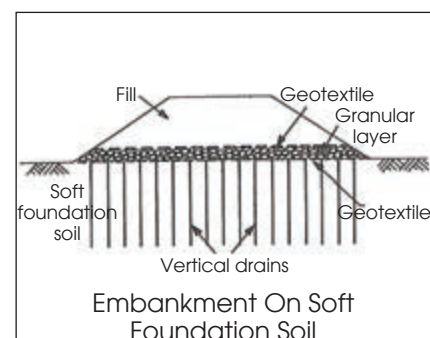
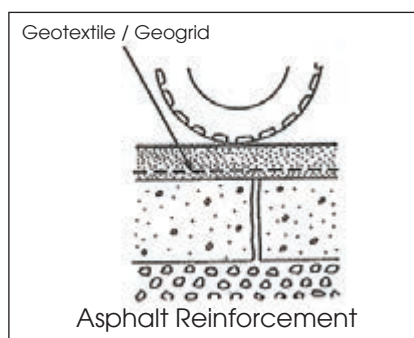
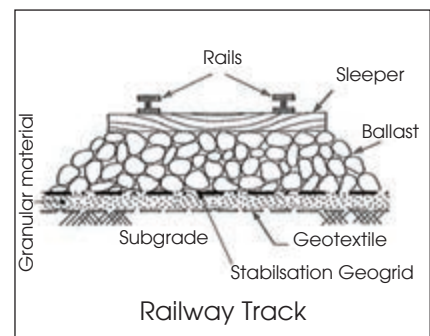
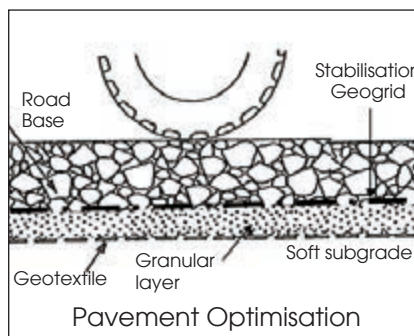
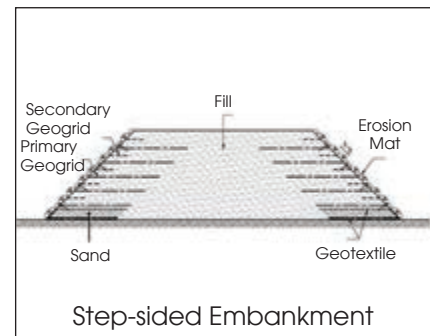
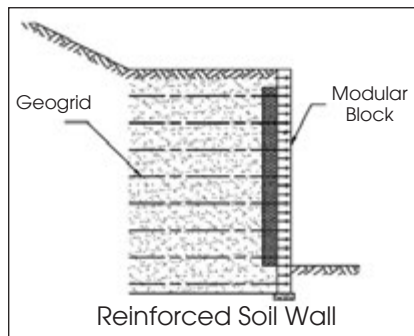
The core purpose of IGS is to provide an understanding of and to promote the appropriate use of geosynthetic technology globally. The society envisions that, in the near future, geosynthetics will become indispensable to the point that they will be regularly included in engineering curricula and relevant design standards.

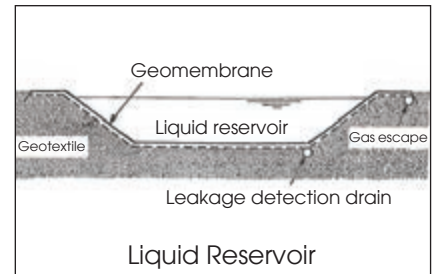
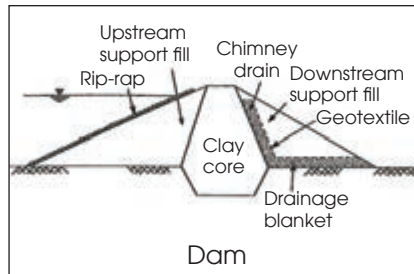
The flagship events of IGS are the international and regional conferences. The International Conference is held once every 4 years while the Regional has the same structure but in years alternate to the International



Malaysia's first application of geogrid in Jitra-Butterworth Expressway (1985)

### Typical Applications Of Geosynthetics In Malaysia





IGS publishes two journals, a peer-reviewed technical journal, *Geosynthetics International* and *Geotextiles & Geomembranes*.

Founded in 2014, the Malaysia Chapter (MyIGS) is officially registered as Pertubuhan IGS Malaysia. Its members comprise a healthy mix of academicians, consultants, contractors, manufacturers, distributors and installers. Over the past few years, MyIGS had collaborated with IEM's Geotechnical Engineering Technical Division to deliver a few evening lectures and talks.

The continuous research & development in Geosynthetics Engineering is achieved through the efforts of all parties in the industry. The current infrastructure constructions such as highways, railways, airports, urban developments as well as preservation of the ecological environment have all benefited tremendously through the use of this new, innovative construction material/technology in meeting the requirements of quality, time and cost. ■

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## Author's Biodata

**Mr. Tee Choon Heng**, Director of *Mega Geoproducts and Services Sdn. Bhd.*, is a pioneer in the application of geosynthetics in Malaysia since 1986. He distributes *Tensar geogrids* and involves in the design and construction of reinforced soil structures.