### SAICE Johannesburg Branch CPD Day on Geosynthetics

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<tr>
<th>Registration</th>
<th>08:00</th>
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<th>30 min</th>
<th>CPD Lecture Programme on Geosynthetics</th>
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<td>08:30</td>
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<td>Introduction</td>
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<td>Part 1: Filtration &amp; Drainage</td>
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<td>Part 2: Filtration &amp; Drainage</td>
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<td>Soil Reinforcement</td>
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<td>Session 7</td>
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<td>Landfills with Geosynthetic Clay Linings (GCLs)</td>
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**NOTE:** Each Session carries 0.2 CPD points. Attending all sessions will give 1.4 Credits

### Content of Each Session

#### Session 1

**Introduction**

There are more applications for Geosynthetics than many designers realise, leading to a major international market for these innovative construction materials which exists because judicious use of geosynthetics instead of conventional materials & techniques can lead to very significant project cost savings. This is particularly relevant when consulting firms and contractors have to bid against their peers to obtain work. The imaginative use of geosynthetics in design proposals can often make the difference between winning a project and being an also-ran.

- Kaytech Engineered Fabrics – South African manufacturers of geosynthetic products. How local **continuous-filament needlepunched nonwoven geotextiles** are made from recycled Polyester bottles.
- What is a Geosynthetic? – Different types available locally
- Properties and implications of using different polymers – Woven & nonwoven geotextiles
- The six main functions of Geosynthetics

#### Session 2

**Filtration & Drainage**

The use of integrated drainage solutions using geosynthetics is a globally accepted practise. However, poor installation techniques can result in less than satisfactory results. This talk presents quality information, based on both theory and practical experience on how subsoil and structural drainage should be designed and constructed.

- How geotextiles work in filtration and when they don’t (mechanisms of piping, blocking, blinding & clogging), including biochemical clogging – ferric hydroxide (ochre) problems and possible ameliorating measures.
- Stone-filled drains vs. fin or panel drains: Performance, cost savings, installation issues.
- Area Drainage: Sportsfield drainage, permeable paving, Panel drains.
- Structural Drainage: Geonet & Cusped sheet systems, Roof Gardens, Parking Areas.
- Septic Tank and Stormwater Attenuation systems: A new approach using HDPE tunnel formers instead of stone leachfields and soakpits.
- Gabion Structures: The need for filters and what can happen when they are not used.
- Earth & Rockfill dams: The extensive use of geotextile filters to control erosion under rip-rap, around clay cores, chimney drains, and toe drains in South African dams.
Session 3
Erosion Control

Uncontrolled erosion results in a host of environmental problems. Many of these problems can be prevented by employing relatively simple erosion control techniques. Among these solutions may be found those that are offered by the use of geosynthetic products. Depending on project requirements, these products can be biodegradable, photodegradable, or nondegradable.

- The South African legislation in respect of erosion control
- Erosion Control with Silt Fences – Design Considerations
- Erosion Control with Biodegradable Geosynthetics – Soil Blankets
- Erosion Control with Geocells – Slope & Channel Lining – Labour-intensive projects
- Earth & Rockfill dams: The extensive use of geotextile filters to control erosion under rip-rap, around clay cores, chimney drains, and toe drains in South African dams
- Gabion Structures: The need for filters and what can happen when they are not used
- Marine & Riverine Erosion Control – The use of Geocontainers & Geotubes

Session 4
Soil Reinforcement

The use of tensile components to reinforce soil is a technique that has been used for more than 6 000 years. What the reinforcing elements are made of has changed over this period, from woven fascines of reed and brush, to today’s modern high-strength geosynthetics. Some very substantial structures are now being built, and this talk is designed to illustrate the techniques used, and using case histories, present the caveats that prudent designers should keep in mind when using these materials.

- The 6 000 Year History of Soil Reinforcement
- Facts about Geosynthetics Used in Soil Reinforcement: SANS 207
- The Components of Geosynthetic Reinforced Soil Walls
- The Use of Geogrids vs. Geotextiles in Reinforcement Systems
- Concrete Block Face Systems
- Green facings and Wrap-Around Systems
- Basal reinforcement
- What Causes Failures!
- Codes of Practise and Standards: SANS 207; CMA Code of Practise
- Comparative Costs of Different Wall Systems

Session 5
Road Pavement Maintenance

If cracks in road surfaces can be prevented from growing into potholes or weakening the pavement layerwork via the transmission of surface water into basecourse and sub-base layers, much expense can be avoided. Many of the ‘traditional methods of sealing cracks and repairing potholes seem however, to result in unsatisfactory outcomes. The proper use of paving fabrics and grids is a time-honoured remedy (in use since the 1930s), and when properly executed the life of pavements can be considerably extended using these measures.

- Cracks in Road Pavements: - The reasons they form & consequences of neglect
- Cracks in Road Pavements: - Frequently futile ‘conventional’ repair techniques
- Nonwoven Paving Fabrics: - How they are installed & how they work
- Glass Paving Grids: - Their nature, where used and how installed
- Composite Glass/Fabric Paving Grids: - Their function in pavements
- Case Histories, Problems & Recommendations: - Useful information

Session 6
Bitumen-Based Formed In-Situ Dam Lining

When considering low-permeability linings for the containment of water or effluent, the designer has several options available, including clay, concrete, geosynthetic clay liners (GCLs) and preformed polyolefin geomembranes such as HDPE, LLDPE and similar. Another option consists of geotextile coated with rubberised bitumen. This proven system is put together on site, and while being cost-competitive with the polyolefin systems, has the advantage of being installed with labour-intensive techniques, by unskilled workers. Anyone can install them, and anyone can repair them without the need for specialised contractors.

- Components of the System: The recommended geotextiles and bitumens
- Comparison with polyolefin geomembranes: Advantages & disadvantages
- Laying the System: A comprehensive ‘How-To’
- Traps and Tips: What and what not to do
Examples of the System: Irrigation, oxidation dams, ornamental ponds etc

The Installation Manual: Useful information

Session 7
Lining Systems with Geosynthetic Clay Liners (GCLs)

Geosynthetic Clay Liners are low-permeability water and gas barriers which use natural Sodium bentonite (montmorillonite clay) as the impervious (typically $\pm 10^{-9}$ cm/s) constituent, contained within layers of geosynthetics. Typical applications include landfill lining and capping projects, raw water and sewerage containment, and ornamental water features. Geomembrane linings will also be discussed. The subject matter will thus be of interest to any designer involved with the containment of water or effluent.

- What is a GCL? – Definition and typical construction details
- The origins and properties of bentonite
- Equivalency: GCLs vs. compacted clay liners (CCLs)
- The economics of GCLs vs. CCLs
- Working with GCLs and Geomembranes: Installation issues:
- Practicality of GCLs vs. CCLs
- ‘Composite Linings’ and ‘Intimate Contact’ explained
- Chemical compatibility of GCLs
- Landfill Capping, cation exchange and other issues

Course Presenter

Peter Davies

Peter works for the Kaymac Group (founded 1945) and is based at Kaytech’s head office in Pinetown, kwaZulu-Natal, in South Africa. Here he serves as Senior Consultant: Geosynthetic Applications. In 2016, he will have been involved in geotechnical engineering and geosynthetics for over 50 years.

- He is a Senior Fellow of, and has served two-year terms each, as National Secretary, Vice President and President of the South African Institute of Waste Management (IWMSA). In 2014 he was appointed as honorary Technical Advisor to the South African Institute of Waste Management (IWMSA). He has represented the Institute on a number of waste-related initiatives, including the steering committee for all editions of the Minimum Requirements for Waste Management Facilities document. He has served on the Project Steering Committee and the Specialist Working Group engaged in landfill design requirements, in particular in updating the section on Geosynthetic Clay Liners. He a committee member of the IWMSA KZ-N Branch Landfill Interest Group (LIG) and has served as its Vice Chairman and Chairman.

- He is an honorary life member, and has been the Vice-President and newsletter editor of GIGSA, the Geosynthetics Interest Group of South Africa, which is affiliated to the South African Institution of Civil Engineers and is the local chapter of the International Geosynthetics Society (IGS). He was the Technical Chair of the IGS/GIGSA GeoAfrica 2009 conference held in Cape Town over 2 – 5 September 2009. This was the first IGS Regional conference to be held in Africa.

Peter has authored and co-authored numerous peer-reviewed technical papers on a wide range of geosynthetics, presented at a number of South African and international conferences.