



The South African Chapter of the International Geosynthetics Society

Dedicated to the Scientific and Engineering Development of Geosynthetics and Associated Technologies

A newsletter of the Geosynthetics Interest Group of South Africa
In Association with the South African Institution of Civil Engineering

February 2003

Where people or company or product names are underlined, these are Internet and e-mail links in the electronic version of this newsletter.

President's Comment

This is the first GIGSA newsletter for 2003, so may I wish all members a happy and prosperous "geosynthetic" year.

Your committee has had its first meeting of the year, and judging by the discussions that took place, GIGSA members can look forward to an exciting year in terms of events and site visits being planned.

It is abundantly clear that the Geosynthetics industry in South Africa has entered a new era, in that the design, specification and installation of geosynthetic products is no longer a commodity shopping exercise (acknowledgements to Peter Dimaio of Engineered Linings). Hopefully, the days of a consultant relying solely on the recommendations of a single supplier for the specification of a particular geosynthetic material are gone. The industry has become far more professional in its approach to the use of geosynthetic materials in civil engineering construction.

As consultants specify particular geosynthetic materials in their designs, they are assuming professional responsibility, and therefore liability, for the materials specified. Also, because of the nature of many geosynthetic materials, the materials technology is advancing rapidly. There is therefore the need for design engineers (and their directors or partners) to understand more fully the geosynthetic materials they are specifying, and the implications of their choice. GIGSA is fully aware of this need and is addressing it in the following manner:

- GIGSA is actively involved in the drafting of the SANS 1526 Specification for the Supply of Geomembrane Linings, and the SANS 10409 Code of Practice for the Installation of Geomembrane Linings (see future newsletters for updates on this ongoing initiative).
- We are planning to hold half-day courses/seminars, aimed mainly at senior management, to provide ongoing education on Geosynthetic materials.
- The GIGSA committee is looking at the recent Engineering Act of South Africa (Act 46 of 2000), regarding work reserved for specialists, particularly as it could apply to the specification of geosynthetic materials.

In addition, GIGSA is registering with DWAF as a "corresponding contributor" for the 3rd edition of the Minimum Requirements documents, to ensure that any reference to the use of geosynthetic materials in the documents is in accordance with current best practice.

Regarding the above points, we will keep you informed of details. Any member who wishes to contribute is more than welcome to contact any member of the GIGSA committee.

Kind regards

Peter Legg
peter@jbawaste.co.za

gigsa Benefactors

Engineered Linings • Kaytech • Aquatan • DuPont SA • Geotextiles Africa • SRK Consulting • Jones & Wagener
• Gundle Geosynthetics • Botank Construction • Amalgamated Packaging Industries • Land Rehabilitation Systems
I-Corp International • Gast International SA

Newsflash: GIGSA-LIG 7ICG Nice Report-Back in KZ-N

The KwaZulu-Natal region of the GIGSA has joined forces with the KZ-N Landfill Interest Group (LIG) to present a report back on the 7th International Conference on Geosynthetics held in Nice, France late last year.

The experienced rapporteurs: - Piet Meyer of Aquatan, Garth James of Kaytech, and Du Toit Viljoen of Engineered Linings will present their views on the technical sessions held at this prestigious quadrennial conference.

The report-back will be held at the Assagay Hotel just off the N3 between Durban and Pietermaritzburg on **27 February**, starting at 14:30. For more, contact Megan Nortje on ktechmn@kaymac.co.za

Messrs Gast International SA will sponsor the function, so attendance is free, and we look forward to the drinks and goodies – thanks guys!

Practice safer eating - always use condiments

New Benefactor Members for GIGSA

1). **I-Corp International** of the USA has joined GIGSA as a Benefactor member. I-Corp's



Dr. Ian Peggs (right) with Danielle Cazuffi (President of the IGS) at a conference on GCLs held in Nuremberg last year.

President, Ian Peggs, has always been a staunch supporter of the IGS, and of GIGSA. A GIGSA-DWAF organised lecture on Construction Quality Assurance (CQA), which was led by Dr. Ian Peggs, and held at the World Trade Centre 22-23 May 1997 was so successful that the funds that were collected from delegates then, formed the

foundation for a continually healthy GIGSA education portfolio bank balance.

I-Corp offers a specialist CQA consultancy service and acts as a third-party CQA inspector. Their local references include work done in South Africa and in Namibia.

Make a point of visiting the I-Corp web site at www.geosynthetic.net. This site presents a huge database on everything to do with geosynthetics and is of great value to professional and student alike. Dr. Peggs can be contacted per e-mail at icorp@geosynthetic.com. Welcome to the SA geosynthetics community lan!

2). **Gast International SA**

The Gast family (Kevin Sr. and Jr.) have demonstrated their support for GIGSA's aims and objectives by signing up Gast International as a Benefactor member.

This Centurion-based company supplies and installs geomembranes and a number of other waterproofing systems for the building industry. Until recently the company has operated on a low-key basis, but we note that Gast's services were on display at the Institute of Waste Management's *WasteCon 2002* exhibition held in Durban late last year. We now also see that Gast is sponsoring the GIGSA-LIG 7 ICG Nice report back in KZ-N. Something must be up! Gast International SA can be contacted at: gast@iafrica.com



Kevin Gast Jr. (left) and Sr. at their Zwahile Guest Lodge near Nylstroom. For a taste of sheer luxury, crack an invitation to stay here!

Plateau: A high form of flattery

Engineered Linings Wins Annual GIGSA Award for Development in Technology

This award was for the development of the technology, plant and equipment for the manufacturing of Engineered Linings' Anchor Knob Sheet (AKS). AKS is a geosynthetic Concrete Protection Liner (CPL) and has been designed to offer highly effective corrosion protection for concrete structures and bulk outfall sewers.



Engineered Linings' AKS CPL being fitted to the mandrel which forms the I.D. former for the concrete sewer pipe. Note the tight fit and the anchor knobs referred to in the text

Made of High Density Polyethylene (HDPE), AKS has recently been specified as the CPL for the technologically advanced sewer system in Singapore where it was accepted after rigorous scrutiny by the specialist international consultants on this project.

The development and testing of AKS was undertaken in South Africa, with the aid of local universities. These assisted with independent testing and verification of results.

AKS has proven itself in the South African market and has successfully been used in several major local sewer projects. A few of these are – the Cape Town Outfall sewer phases 1,2 & 3; the Neave Sewer in Port Elizabeth phases 1, 2 & 3; the Swartkops sewer in Port Elizabeth phases 1, 2 & 3; the Mondeor Sewer in Gauteng and the Gaborone outfall sewer in Botswana.

One recent addition to this AKS reference list is the new Modderfontein outfall sewer in Johannesburg. By using AKS, the consultants – Civec Jhb – intend to ensure the longest possible life for this 7,48 km long sewer system. The bulk of the AKS is 3,0 mm thick; with 4,0 mm thick AKS being used in areas deemed to exhibit high turbulence and heavy abrasion.



A view of the AKS mould, shuttering, HDPE liner and reinforcing, all being combined to produce the resultant CPL system.

AKS lining is said to offer a permanent solution to the problem of corrosion in concrete sewers. The AKS is



The complete AKS lined pipes ready for transport to site.

fitted to the internal diameter of the pipes using mushroom shaped anchors, which are integrally cast into the inside of the concrete pipe wall during the manufacturing process.

These anchors are able to withstand a negative hydraulic force in excess of 40 kg each or a combined force of 4 tonnes per square metre. The system offers clients the benefit of the structural strength of concrete coupled with the well-proven superior chemical resistance of HDPE

The 360° lined pipes for the Modderfontein project are currently being manufactured by Rocla and Southern Pipe Contractors. Engineered Linings has set up a production site at the Rocla yard for the pre-manufacture of the AKS tubes before these are cast into the concrete.

The foregoing pictures are attached to show the pipe construction operation. It is not practical to go into much more technical detail in a journal of this nature, but Engineered Linings have extended an invitation to GIGSA members, colleagues and potential clients, who might be interested in learning more about this technology, product and operation, to attend a site visit.

If you would like to attend such a site inspection, please contact Falk Hedrich, John Harrower or Bernard Asquith at Engineered Linings' Johannesburg office. Tel (011) 974 1397, or e-mail at: jhb@englining.co.za as soon as possible

Anyone can hold the helm when the sea is calm

Evaporation Ponds In a Hostile Climate

The much-talked about Skorpion Zinc Mine situated in the south-western part of Namibia is nearing commissioning stage. This project has utilized a large contingent of South African skills over the last 2 or so years with most of the major South African Civil and Building Contractors being involved in the construction work.

Part of the infrastructure requirements for the mine development involved the construction of lined evaporation ponds. The ponds were approximately 170,000 square metres in total area, divided into 6 dams and lined with 2mm HDPE. Bateman's were the design and supervisory Engineers with the construction work being undertaken by Group 5 Namibia and Aquatan Lining Systems as the specialist lining installer.

The design of the evaporation ponds and liner provided some interesting challenges for the design Engineers and for Aquatan who provided a large amount of input at the design stage of the ponds. As the ponds were to stand empty for long periods in the extreme weather conditions

on site, the effects of the prevailing high wind and extreme temperature variance were a real concern. Design wind speeds of 144km/hr (recorded on site) subjected the liner to considerable uplift forces.



170 000 M² of geomembrane lining at Skorpion Mine – contracts like this don't come up every day in southern Africa!

These forces were greatest on the windward side slopes but were significant enough on the floors to warrant attention. In fact, on one occasion, under extremely wind conditions, the floor liner was sucked off the floor in an inverted bow from anchor trench to anchor trench. Anchor trenches were positioned through the floor of the dams as well as around the wall perimeter to counteract this effect and to limit cumulative uplift forces. Calculations determined that the anchor trench grid should be limited to 100m x 100m as this limited the uplift forces allowing them to be managed by "normal" sized anchor trenches.



An aerial picture of the evaporation ponds at Skorpion

In order to economize on space and minimize dead space, the ponds were laid out in close proximity, with a number of common earth walls. Due to the narrow top of wall

width on the common walls, anchor trenches on these walls clashed and common anchor trenches had to be utilized. The width of the ponds (approximately 100m) meant that the linear expansion of the liner would be approximately 12m under the design temperature differential. This movement induces considerable stresses in the liner, which are resisted by the anchor trenches. As the principles of anchor trench design are to allow the liner to slip before it is stressed, it was necessary to break the liner at the common anchor trenches to allow slip.

As the trenches now had a double HDPE layer, the anchor trench design had to account for the lower slip co-efficients of liner-to-liner vs. liner-to-soil. Calculations confirmed that a deeper narrower trench was more efficient than a wider shallower trench. The narrow wall width also complicated the trench backfill operation. Careful planning of work was required to maximize access to the trenches to improve the efficiency of this operation and to limit access on top of the liner during backfill operations.

Conditions on site were also a challenge for Aquatan's installation crew. The site is situated in the Namib Desert where extremely hot, dry and windy conditions are the norm. The nearest town was 30km away with extremely limited facilities. Any breakdown spares or unplanned installation items had to be sent by courier to within 100km of the site and fetched by vehicle or flown in. The hot and windy conditions on site during the installation period meant that extreme care had to be taken to prevent loss of un-welded liner from unpredictable winds and / or over stressing of the liner due to excessive movement and trampolining. The early mornings on site were also subject to fog conditions, not suitable for effective welding of the liner. Care therefore had to be taken to ensure that welding was carried out to meet Aquatan's quality requirements.

The contract proved to be a great success for all parties involved. Earthworks construction work commenced in January 2002 with liner installation starting in April 2002. The works were completed by the end of May 2002 well within the programmed completion date.

Contact Mike Wittman at mikew@aquatan.co.za for more information.

**Fortune knocks but once, but misfortune has
much more patience!**

1st African Young Geotechnical Engineers Conference – Swakopmund, Namibia

The First African Young Geotechnical Engineers Conference will be held on 14 to 16 April 2003 at the National Marine Aquarium in Swakopmund, Namibia. The conference is held under the auspices of the SAICE Geotechnical Division and ISSMGE (International Society for Soil Mechanics & Geotechnical Engineering) and in collaboration with SAICE (South African Association of Civil Engineers), SAIEG (South African Institute of Engineering and Environmental Geologists) & SANIRE (South African National Institute for Rock Engineering).

The theme of the conference is "Mining and Civil Geotechnics – Foundation for an African Tomorrow". The aim is to:

- Unite and spread knowledge across Africa, thereby contributing to the African Renaissance and capacity building in the African geotechnical community.
- Highlight the role of young geotechnical engineers in the mining and civil construction industry.
- Develop a platform from which young geotechnical engineers can share their knowledge and experience, indicating the direction of geotechnical engineering in the future
- Attract as many young engineers and engineering geologists as possible from other African countries.

Several sponsorships have been received, with Franki being the Gold sponsor and Navachab Mine from Namibia a Silver sponsor.

In total thirty-nine papers will be presented: 31 from South Africa, 1 from Tunisia, 3 from Namibia and 4 from Mali. A technical tour will be held on 17 April 2003 to the Rössing Uranium Mine just outside Swakopmund. Over and above the full technical programme, some social events have also been planned for the duration of the conference. These include a conference dinner in the form of a fishbraai on the beach and a Welwitchia tour of the desert.

For further information and a provisional programme please visit the Geotechnical Division website at <http://www.up.ac.za/academic/civil/geodiv/> or contact Lesley Stephenson at Tel: (011) 717 7031, fax: (011) 339 7835 or email: l.stephenson@ee.wits.ac.za.

Liza du Preez
1st AYGEC Subcommittee Chairman

Geotextile Forms Part Of A Unique Erosion Control Method

BCP Engineers of Westville have developed a unique anti-erosion system that has been successfully used to rehabilitate a large erosion canyon caused by heavy rains, as well as vegetation loss below the Gateway complex at Umhlanga Rocks north of Durban.

The system, called the Geo Step, was born through necessity when it became obvious that more than conventional methods would be required to rehabilitate the affected area. Cost was also a factor and BCP's new system has saved the client R1-million in the rehabilitation of the erosion gully that originally measured 400 metres long, six metres deep and 20 metres wide.

"The area is reasonably steep," says BCP's Brian Downie. "It has a grade of about five and it had always survived because the farmers were managing the land and the flows through it were relatively limited. However, with increasing development, concentrated flow volumes started to increase.

A photographer who'd flown over the area and had taken pictures of the damage, brought the massive gully that was gouged into the countryside to Brian's attention.

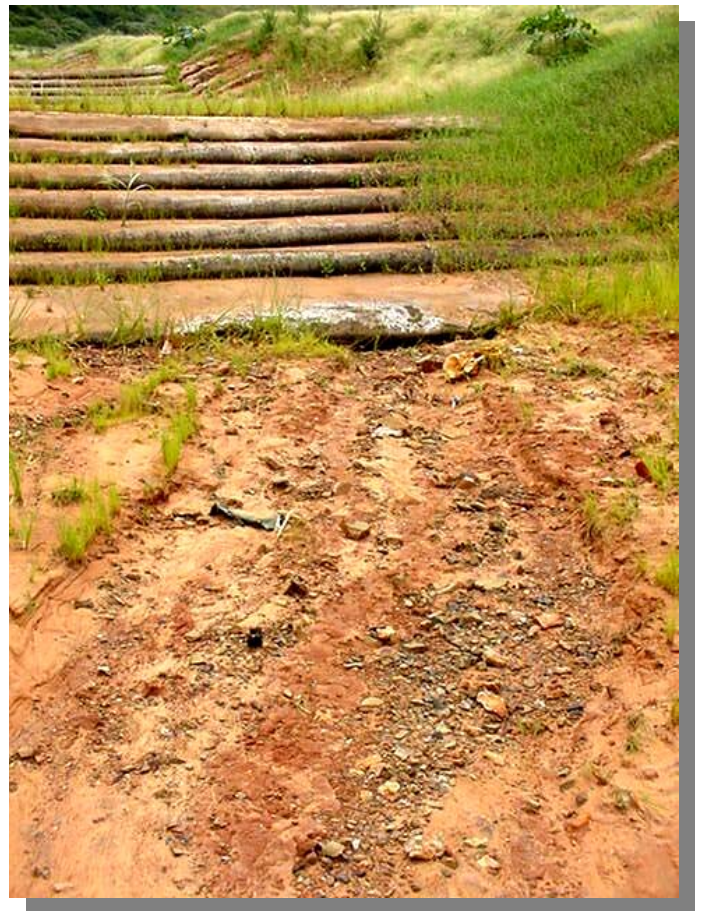


The problem . . .

and asked BCP to look at solving the erosion question and to rehabilitate the affected area.

"We looked at conventional engineering as a solution," comments Brian. "But this would have cost R1.4 million – with a guarantee that the problem wouldn't crop up again. This, though, was a bit on the expensive side so we examined less conventional methods and came up with some alternatives".

"Moreland chose one which brought the cost down to R 400 000 – it saved our client R1-million – but it was a system that I was a bit apprehensive about because it didn't appear to be a long-term solution. However, Moreland was prepared to accept some of the risk. So, we shared it."



The Geo Step solution . . .

BCP completed the design for the Geo Step system and Afrocon Engineering International successfully tendered for the installation.

The biggest cost-factor involved in the project was replacing the soil that had been lost. More than 8 000 cubic metres had been washed away.

"We had to import soil," says Brian, and it was brought in soil from new works and projects within Umhlanga Ridge and other areas close by. This was a major cost component in this project.

"We created a series of steps called check weirs using the Geo Step technique. The ground between these weirs is level. Stormwater flows down the steps, dissipating the energy and allowing the water to dissipate and flow at reduced velocity to the next Geo Step. And so on.

"In the case of the Gateway gully, there are 12 Geo Steps in place, around 20 m apart."



Close-up view of a tier of Geo steps, showing Vetiver grass taking over.

"The Geo Steps used at Gateway are between one and two metres high," says Brian. "We could have chosen to go for a lesser number of weirs which would have been twice these heights. But we felt that more weirs at a lower height would be more effective, and we've been proved right."

To rehabilitate the erosion gully at Gateway, the gully was filled with imported soil. On top of this, the geotextile (3,3 metres wide) was rolled out across the width of the gully at the relevant weir points. This layer was then filled with 200 mm of clay. The geotextile was then folded back across the clay fill and pegged, forming the first tier.

"Once the first tier is in place," says Brian, "you move back about 300 mm and repeat the process. It's like stacking gabions, but this system is far more flexible. Then, to anchor the system, we cast a block of concrete at the end of top tier. This is anchored with fencing standards going around a metre into the ground. This top slab prevents water undermining the top Geo Step."

The geotextile BCP/Africon selected for the Gateway rehabilitation project came from Kaytech Engineered Fabrics. Over 5 000 m² of Kaytech's bidim A4 were used in this Geo Step programme.

Brian added "To further enhance protection of the area, Vetiver grass has been planted above the top weir. This is a fascinating plant. It has a deep root system and it is quite bushy. When fast-flowing waters wash over it, the Vetiver lies flat and covers the underlying soil. When the flood has passed, it simply stands erect again. This plant comes from Mauritius and is used to retain banks and generally stop the erosion of topsoil in sugar cane fields there - and it's working wonderfully at Gateway."

For more information, contact Julian Maastrecht at ktechjim@kaymac.co.za

Some Upcoming Events

"Advancements in Geosynthetic Clay Liner Testing Methods, Stability Assessments, and Long-Term Performance"

Symposium to be held June 20, 2003, Denver, Colorado, USA. Sponsored by: ASTM Committee D35 on Geosynthetics. <http://www.astm.org/SYMPOSIA/D35PreImProg.pdf>

"Two Rivers Conference"

North American Geosynthetics Society Conference in conjunction with the 56th national conference of the Canadian Geotechnical Society. 26 Sept. to 1 October, Winnipeg, Manitoba, Canada. More information at: <http://home.cc.umanitoba.ca/~cgsman/cgs2003/>

"Sardinia 2003" Ninth International Waste Management And Landfill Symposium.

S. Margherita di Pula, Cagliari, Italy. 6 to 10 October, 2003. More information at www.sardiniasymposium.it

"The Involvement Of Geotechnical Engineering In Infrastructure Development In Africa"

ISSMGE 13th African Regional Conference Marrakech, Morocco December 8-11, 2003. Organised by: Comité Marocain de Mécanique des Sols et des Roches. Local contact: Peter Day day@jaws.co.za

3rd International Mining and Industrial Waste Management Conference.

17 - 19 February 2004. Under the auspices of the Geotechnical and Environmental Engineering Divisions of the South African Institution of Civil Engineering. Contact: [Leslie Stephenson |stephenson@ee.wits.ac.za](mailto:Leslie.Stephenson@ee.wits.ac.za) *"Geotechnical Engineering with Geosynthetics"*

"EuroGeo 3". 3rd European Geosynthetics Conference.

Munich, 01-04 March 2004. Organised by the German Society of Geotechnics (DGGT) under the auspices of the International Geosynthetics Society (IGS). Munich, Germany. 1-4 March 2004. Contact: General Secretariat: Technische Universität München. eurogeo3@bv.tum.de / www.gb.bv.tum.de/eurogeo3
The deadline for receipt of abstracts is 28 February 2003.

Did you find something of interest in this newsletter? Why not become a GIGSA member and support our prime aim (which is to educate you). It costs very little! Contact membership Secretary Pieter Oosthuizen: Pieter@arq.co.za for details on joining.