

ARQ Goes International in Saudi Arabia

Case History: Booker Tate - United Sugar Jeddah Retail Sugar Store

INTRODUCTION

The United Sugar Company of Jeddah required a new warehouse for storing their product after import.

The floors on two existing sugar stores nearby, had settled by up to 200mm. This was to be avoided in the new structure.

INITIAL EVALUATIONS

A geotechnical investigation conducted at the site generated recommendations for removal of the material some 1.5m below the surface, and replacement with various layers of compacted cobbles/gravel. With this solution, settlements in the order of 30 to 50 mm were predicted.

In order to assess whether these figures were reasonable a simple plane-strain finite element analysis was conducted using the Sage Crisp computer program. Without a concrete slab wearing surface in place, the maximum settlement was predicted at 41mm. This tended to confirm the deductions made in the geotechnical report.

This procedure (i.e. 1.7m of compacted cobbles/gravel) would be very costly. Also, the compacted cobbles/gravel might have proven difficult to penetrate during pile installation for column support.

ALTERNATIVE SOLUTIONS

It was felt that a more cost-effective solution might be generated using a stiff geogrid placed at the -1.7m level and then backfilling with compacted sand as opposed to the cobble/gravel layers.

This layout was analysed with a TRC 30 Aramid geogrid reinforced layer (3% strain at break) and a predicted settlement of 36 mm under 100 kPa applied stress and a 200mm thick concrete pavement was obtained.

As the settlements under the two conditions were roughly similar, this option was explored with the local Engineers Pilkington Barker and Associates and with the Client in Jeddah. A favourable response was obtained.

DESIGN

Excavate and remove to temporary stockpile the upper layers of material to a depth 300 mm above the water table.

Compact the insitu sand to 100% Mod AASHTO density if no signs of pumping occur.

Lay and tension the TRC 30 Grid with 300 mm overlaps filled with 20 mm of coarse sand.

Backfill with the stockpiled material (LS<1% and CBR>30) and compact to 100% Mod AASHTO density.

CONSTRUCTION

This proved to be singularly uncomplicated with the final product being speedily completed.



Laying of TRC30 Aramid Geogrid

LESSONS

Cross border sorties in the specialist field of geosynthetic engineering are not always fraught with traps, as the project has demonstrated. However they are not possible without close co-operation and here, Niel Barker of Pilkington Barker and Associates and Peter Davies of Noel P Hunt deserve special mention. Thanks also go to ARQ's Pieter Oosthuizen for conducting the finite element analysis.

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President's Comment

In the last newsletter, I reported that I had just returned from Germany after attending the GSE sponsored one-day conference on geomembranes presented by Bob Koerner. In this newsletter, I have the privilege of reporting back on a one-week trip to Melbourne, where I represented GIGSA at an international Geotechnical and Pavement Engineering Conference. Chadwick Geotechnical, who also sponsored my trip to Melbourne, hosted the conference.

The organizers certainly got their pound of flesh! The three-day conference was preceded by a half-day geosynthetics seminar, where I was the keynote speaker for almost two hours, presenting four papers on different geosynthetic applications. In the main conference, I was then asked to repeat three of the presentations. Thanks to Kelvin Legge, Garth James and Colin Redman who contributed papers for my presentations. Tim Chadwick and Lucas Pardo of Chadwick Geotechnical both send their greetings to all GIGSA members.

I cannot believe that it is almost two years since I was elected as president. It is now time for GIGSA committee elections and, having received more than 10 nominations, we will be sending out ballot papers for election of the new committee shortly. Please exercise your constitutional right to vote for the candidates of your choice.

The GIGSA website is up and running, thanks to our local Webmaster Peter Davies who has coordinated its development by "web mistress" Lara Peggs of Geosynthetica in the USA. Please visit the website and give us comments. Remember that it is there for your benefit so we need your input to ensure that the website meets your needs. I believe that we truly have a professional website. Please visit www.gigsa.org.

On 22 June we ran a highly successful half-day training seminar on CQA for lining installations. Anton Bain and Liza du Preez each gave presentations on the new SANS 1526 and SANS 10409 respectively, and Stan Jewaskewitz gave a very interesting presentation on development of a lining CQA Plan, which was supported by two case histories from the Middle East. Aquatan and Engineered Linings then topped off the afternoon with practical demonstrations of geomembrane welding and testing methods. Following the interest shown in this event, we have been requested to repeat the CQA Seminar in Cape Town, probably in the second week of September.

For those of you who will be attending WasteCon 2004 in Sun City in October, GIGSA is pleased to announce that the half-day training seminar to be held on Wednesday 13 October will consist of a series of lectures on waste geotechnics presented by Professor Ed Kavazanjian. Thanks to Kelvin Legge for securing the services of this highly experienced geotechnical engineer, and to the Department of Water Affairs & Forestry for its generous sponsorship of Ed's travel costs. See later in this newsletter for details of the GIGSA WasteCon seminar.

Lastly, may I remind you of the GIGSA Annual General Meeting to be held on Monday 25 October 2004? We are honored to have Dr Daniele Cazuffi, current president of the IGS as our guest speaker at the AGM, so don't miss this date!

Best wishes

Peter Legg
peter@jbawaste.co.za

GIGSA Awards: Call for Nominations

Members of GIGSA are invited to submit nominations for biannual awards in the following categories:

1. Development and Technology
2. Construction
3. Outstanding service to GIGSA

The submissions should reach the Awards Committee c/o Kelvin Legge at either fax: 012 336 8561 or e-mail: leggek@dwaf.gov.za by Thursday the 30th of September at 13:00. Receipt of nominations will be acknowledged.

A nomination will be considered if it is clearly stated for which one of the above three categories the proposal is made, the nominee is identified and a motivation not exceeding 500 words is provided, with contact details of the nominator. A panel of three committee members whose recommendations will be ratified by the President will consider all nominations.

The awards for the 2003/04 period will be presented at the AGM on Monday the 25th of October 2004.

Your considered submissions are eagerly awaited.



Rehabilitation of the Bergsig Sewage Oxidation ponds in Springbok

Old, unlined oxidation ponds have been causing concern to a number of municipalities. Not only because of the potential pollution impact that they present to the groundwater but also from a simple health and safety aspect.

The Nama Khoi Municipality at Springbok recently undertook to have their oxidation pond system at Bergsig lined with an HDPE geomembrane liner.

The engineers for this project, BVI Consulting Engineers together with Engineered Linings, put together a proposal and program that would accommodate the staged rehabilitation of the five ponds without affecting the general operation of the sewage treatment works.



General condition of the ponds prior to the start of the contract

In an effort to save on the overall cost of the rehabilitation, the Municipality's civil construction division undertook the emptying, cleaning and sub-grade preparation of each pond.

In a predetermined sequence, each pond was emptied, vegetation removed and all earth works completed. The sub-grade was then covered with a geotextile as an under liner protection layer and a 1,0 mm thick HDPE liner was installed as the barrier. A total area of over 17 000 m² of liner was installed. The well-planned sequence of activities ensured that the operation of the sewage treatment works was not affected.

The lining of all the ponds took place over a three-week period and credit must be given to the Client, the Consultant and Lining contractor for completing the project within the predetermined budget and time constraints.



Sewerage treatment was not halted during construction



A 240 g/m² geotextile was used as a liner protection layer



Pond lining nearly completed



A completed pond, back in operation

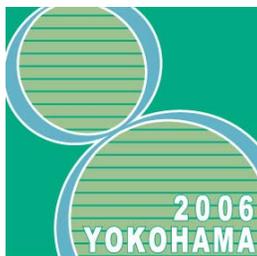
Client and earthworks contractor – Nama Khoi Municipality

Consultants – BVI Consulting Engineers

Lining contractor – Engineered Linings

For any further information on the lining and rehabilitating of oxidation ponds, please feel free to contact

Peter Hardie at Engineered Linings – (021) 551 2430 or
Mr Maritz Myburgh at BVI Consulting Engineers – (027) 712 9990



Eighth International Conference on geosynthetics (8ICG)

Dear IGS Chapter President and Secretary:

RE: Submission of abstracts of papers for the 8ICG (Eighth International Conference on Geosynthetics)

With reference to our first letter on March 2004, we are writing you this letter in order to give your IGS Chapter more details to organize the submission of papers to be included in sessions devoted to geosynthetics case studies at the 8ICG.

As you know, this initiative means that authors can submit abstracts of papers as follows:

- As always, authors can submit an abstract for an individual paper on any geosynthetics-related topic directly to the Conference Secretariat of the 8ICG.
- In addition, authors can submit a maximum of one abstract on a geosynthetics case study through their IGS Chapter.

Your IGS Chapter will be allowed to send in total a maximum of ten abstracts on geosynthetics case studies. The first selection of this type of abstracts is only under the responsibility of your Chapter: the only request from IGS is that at least one author for each of these abstracts (and subsequently papers) has to be an IGS member.

However, regardless of submittal method, no author can be the first author of more than two submitted abstracts for papers at the 8ICG.

All types of abstracts, not exceeding 2 pages in length, are due **31 March 2005**.

The International Paper Selection Committee of the 8ICG will subject all abstracts to the same critical review process, regardless of submittal method (individual submission or through your IGS Chapter). Authors of accepted abstracts will be contacted by the Organizing Committee and invited to submit their final paper(s) by **31 October 2005**. The final papers will be subjected to peer review and the author(s) advised of final

acceptance. Therefore, the Organising Committee of 8ICG will advise directly the corresponding author of the outcome of the abstract and paper review process also for those papers submitted through your IGS Chapter.

Therefore, we kindly invite you to submit abstracts to 8ICG and also to visit the related website www.8icg-yokohama.org.

Best regards

Daniele Cazzuffi
IGS President

Fumio Tatsuoka
IGS Vice - President

President of 8ICG Organising Committee

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New cell at Coastal Park Landfill site

Title of project: New Phase 2B lined cell and Pollution control (March 2003 to March 2004)
Value: R9,3 million for construction of new cell
Client: City of Cape Town: CMC Administration Consulting Engineers, Construction management, Geomembrane quality assurance
Officer/s: BKS (Pty) Ltd

The Coastal Park General Waste (G:L:B+) landfill site, in Cape Town, South Africa, is positioned a few hundred metres inland from the Muizenberg coastline, wedged between a huge commercial site, a wastewater treatment works, and a nature reserve to the north. The site is fully exposed to the natural elements including the prevailing southeasterly wind, which poses an ongoing challenge.



Figure 1- New Phase 2B cell



Figure 2 - Connecting the new lining system to the existing liner

The new cell (Phase 2B cell) approximately 5ha in extent, comprised:

- Clearing and chipping of vegetation to use for erosion control;
- 100,000m³ of excavation for use in the liner layerworks, fill for roads and for future capping.
- The construction of 53,000m² of 1mm smooth HDPE and 61,000m² of 2mm smooth HDPE geosynthetic membranes;
- The installation of sand layers and slotted pipes as the leachate collection and a leakage detection system as part of the liner, over the base and side slopes;
- HDPE drainage pipes directing any flow of leachate to pre-cast concrete sumps lined with 2,5mm HDPE Anchor Knob Sheeting.
- The construction of an access road to this new Phase 2B wastefill area and an inspection road around the new cell.
- The construction of lined storm water berms and canals (with 2mm HDPE);
- A new pump station building, pumping into an existing foul sewer rising main
- Bulk electrical supply.

- Pump control and management design and installation.



Figure 3 - New leachate collection layer

The Contractor for the project was Burger & Wallace Construction and their sub-contractor (suppliers and installers of the geomembrane) was Engineered Linings. TRI Laboratories in Texas, USA did the quality assurance assessment of the manufacturing plant of all the geomembrane, SL Ltda in Chile. The University of Cape Town performed most of the quality assurance testing of the samples taken from site during the installation of the geomembrane.



Figure 4 - new pump house

A small geosynthetic challenge was to weld new 2mm HDPE geomembrane sheets to 3 year-old 2mm HDPE sheets that had been exposed to corrosive liquids and stresses. Exposing the liner was the biggest challenge whilst welding the two together posed no problems.

BKS continued to oversee and manage all the quality assurance testing and review of the manufacturing and installation of the geomembranes on behalf of the client.

The Contract progressed without any delays and BKS would like to commend all parties involved in the project on a successful and highly professional job well done.

For more information, contact Richard Emery at BKS. Tel: 021 950 7570 / Fax: 021 950 7502 / richarde@bks.co.za



Special Invitation



The Department of Water Affairs and Forestry (DWAF) and the Geosynthetics Interest Group of South Africa (GIGSA) invite you to a specialist presentation on landfill technology. The keynote speaker, Professor Ed Kavazanjian of the USA will be addressing waste properties and seismic loading of landfills during the two morning sessions of the DWAF and Gigsa seminar on Wednesday the 13th of October 2004 at Wastecon.

[There is no charge for attendance at the seminar](#)

CV of Professor Ed Kavazanjian

Professor Ed Kavazanjian is professor of Civil and Environmental Engineering at Arizona State University. Ed holds Bachelors and Masters degrees in Civil/Geotechnical Engineering from M.I.T and a PhD in Geotechnical Engineering from the University of California at Berkeley. His professional experience includes both research and practice on design and construction of waste containment systems, the mechanical properties of municipal solid waste, and geotechnical earthquake engineering. He is co-author of the USEPA document *RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities*.

At the start of this session, the Gigsa President will make the inaugural award of the **Kelley Nicole Legge Floating Trophy**



Route 5

Wednesday 13th October 2004

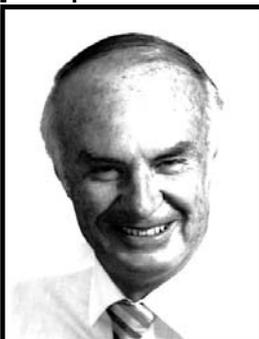
**DWAF and Gigs course on Landfill
Geotechnics**

For further information call Kelvin Legge: Tel: 012 336 8677 or e-mail: leggek@dwaf.gov.za

Reinforced Earth (Pty) Ltd, a member of the Freyssinet group, is seeking to employ a qualified civil engineer starting January 2005. If you are interested then please contact Andrew Smith on his cell phone 083 442 9930 or e-mail andrews@recosa.co.za All applications will be treated in strict confidence.

Obituary: Gavin McFarlane

GIGSA notes with regret the recent passing of Gavin McFarlane, a director of the Kaymac group of companies.



Gavin introduced geotextiles to South Africa in the early 1970s, when he brought a product known as *bidim* back to South Africa on returning from an overseas business trip to France, and introduced the product to Noel P Hunt (now Kaytech).

The product was welcomed by the civil engineering community and

became the market leader in its field. In 1978, under Gavin's direction, Kaymac set up a plant to manufacture *bidim* at Atlantis in the Western Cape, and the rest is history.

Gavin was a true geotextile pioneer in South Africa and GIGSA records his loss to the industry with much regret.

Upcoming Events

Geomembrane Liner CQA Seminar

14 September 2004

University of Stellenbosch – Bellville Campus
Please see the GIGSA website for invitation and registration details:

www.geosyntheticssociety.org/GIGSA/calendar.htm

Chapter Meeting Dates

25 October 2004

AGM

If you would like to know more about GIGSA's Committee meetings, or attend as an observer, please contact GIGSA Secretary Rod Drayton at rdrayton@aquatan.co.za

WasteCon 2004

Sun City, South Africa

11-15 October 2004

Organized by the Institute of Waste Management of Southern Africa

Visit the IWMSA web site at www.iwmsa.co.za/

The Geosynthetics Interest Group of South Africa

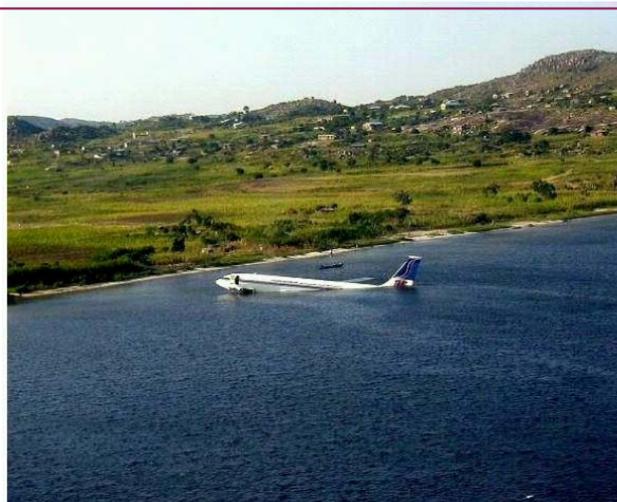
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The mission of GIGSA is to be a non-profit organization dedicated to the scientific and engineering development of geosynthetics and associated technologies in South Africa.



Always use the right tool for the job!



Airlines we would prefer *not* to fly with (No 2 of an ongoing series . . .)