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**The South African Chapter of the
International Geosynthetic Society**
Established in 1983 and 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 Institute of Civil Engineering**

July 2006

Jones & Wagener: 40 years of engineering

Jones & Wagener was founded in 1966 by Winston Jones and Fritz Wagener. Initially the practice specialised in structural and geotechnical engineering. With time, and in response to market needs the geotechnical side of the practice also expanded into the fields of tailings and waste management, and environmental engineering.

Jones & Wagener first started specifying geotextiles in the 1970s to be used as a separation layer in underdrains of tailings dams. One of the first applications of geomembranes in South Africa was also in the 1970s when extensions to phosphor-gypsum tailings dams at Omnia near Rustenburg were lined with 500 and 750 micron sheets of polyethylene. (*A case of fools rush in where angels fear to tread?*)

A significant milestone for the advance of geosynthetics, and perhaps more specifically geomembranes, was the publishing of the DWAF Minimum Requirements in 1994, which contained specific guidelines for the design of lining and capping systems for both hazardous and general waste facilities. Since 1994, J&W was privileged to be involved in the design of most of the new commercial hazardous waste facilities in the country. Some of the more challenging projects were the reconstruction of the failed Bul-bul Drive landfill and the construction of the extensions to the Shongweni Landfill on the steep hillsides of KZN. These projects made us aware of the danger of only focusing on liner configurations to provide optimal environmental protection, and possibly ignoring fundamental geotechnical considerations.

The strain and friction characteristics of the various components within a lining system are often not properly considered. It also seems that many designs assume that virtually no hydrostatic head will develop on the basal liner. It is our experience that hydrostatic heads do develop, whether due to high rainfall, co-disposal of liquids or clogged drainage systems.

There is no doubt that the local geosynthetic industry has made significant advances in the

past three decades. Credit is due to the suppliers who have made technology and experience available to our market, and DWAF officials that not only played a regulatory role in approving (or not approving!) designs, but have often advised on the proper use of geosynthetics.

In my experience (and this applies to our company as much as to anybody else) there are, however, still some problem areas. To name a few:

- Geotextiles and geomembranes are still not correctly specified.
- On-site QC & QA is insufficient when layer works are placed over geomembranes, be it the prevention of folds to ensure a composite liner effect, or to prevent damage due to pedestrian and vehicular traffic.
- Insufficient cover over GCLs in capping design is specified.
- Many designers specify a composite liner on the side walls of hazardous lagoons consisting of a geomembrane over a GCL, with no overlying ballast layer to ensure that the GCL is subjected to a confining pressure.
- In spite of all the available research on the benefits of composite liners, lining systems comprising multiple geomembranes with drainage layers in between are still called for.

From Jones & Wagener's side we trust that GIGSA will continue its vital role in ensuring that we learn from each other and from the international geosynthetics community, which will help to keep all involved designers, installers and manufacturers at the fore-front of this ever changing field of engineering.

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Benefactor Members (in order of joining)

Engineered Linings ♦ Kaytech ♦ Aquatan ♦ Geotextiles Africa ♦ SRK Consulting ♦ Jones & Wagener ♦ DuPont SA ♦ Gundle API
♦ Land Rehabilitation Systems ♦ I-Corp International ♦ Gast International SA ♦ ARQ Consulting Engineers ♦
Naue GmbH & Co. KG ♦ Reinforced Earth South Africa

Lining the Tabokoto tailings dam facility in Mali

Since Gundle Geosynthetics' establishment in January 2005, the company has managed to secure a number of large contracts locally and across the African continent. One of these contracts was the lining of the tailings dam facility at the Tabakoto Gold Mine in Mali.



Overall view of the Tabakoto site

Originally the tailings dam was to be lined with clay sourced from the surrounding areas. However, after a series of geotechnical tests were performed, the clay was found to be dispersive.

The client, Nevsun, aims to be environmentally conscious and thus decided that replacing the clay liner with a 1mm thick HDPE geomembrane was the route to follow.

The effective quality control and assurance procedures implemented during the installation of all geosynthetic liner systems contributed to the decision to follow this route.

The project was supervised ECMP, who were also the designers and project managers on this project. Gundle Geosynthetics was awarded the task of lining the tailings facility.

Two crews were mobilised to site under the supervision of Gundle's operations director. Once the installation operations commenced, it became clear that working in West Africa is no joke. The crews were under immense pressure to perform while having to deal with harsh wind and sand storms which hampered progress on the project.

These conditions notwithstanding, the project was completed successfully and the client was able to utilise the facility as programmed.

Nevsun and ECMP provided substantial logistical support, and this contributed greatly to the ultimate success of the project



Close up of lining system

Project Details:

Quantity:
 320 000m² -1mm Smooth HDPE Liner
 41 000m² -1mm Mono-Textured HDPE Liner
 Effective Installation Time: 40 days

Gundle Geosynthetics strives to ensure that all geomembranes supplied adhere to the highest standards and specifications. For this contract, as with all industrial projects, liner was procured from the Huitex Corporation. In order to ensure the quality of the Huitex liner, it was sent for independent testing to the TRI in Austin Texas, where the liner passed all tests commissioned.

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Today's survival tip:

Next time you are too drunk to drive, walk to the nearest Debonairs, place an order, and when they go to deliver it, catch a ride with them. liver it, home



Update to today's survival tip:

When catching a lift with the delivery guy give him the long way directions home - delivering the pizza after 45mins gets you the pizza and the lift for free.

“Prez Sez”

I am back! Many thanks to my Vice Prez Garth James for his contributions to the April newsletter. I believe that it was refreshing to have a different style and viewpoint expressed in this section of the newsletter.

By all accounts, the construction industry in general is continuing to boom, and with the 2006 World Cup a thing of the past, there are already signs of accelerated development ahead of our 2010 World Cup preparation. Apart from the associated use of geosynthetics in all aspects of construction, it would be great to receive reports of specific applications of geosynthetic products in the development of the new soccer stadiums and related structures. Judging by the articles received for this newsletter, our member companies are all extremely busy at present, and a number of interesting projects are featured.

WasteCon 2006 is almost upon us (5-8 September), and we look forward to a great event at the Lord Charles Hotel in Somerset West, hosted by the Western Cape Branch of the Institute of Waste Management. From a preview of the programme, geosynthetic lining systems will feature prominently in a number of the papers to be presented. I would like to encourage GIGSA members to participate actively in the workshop on the proposed 3rd Edition of the Minimum Requirements to be held at WasteCon, particularly regarding geosynthetics.

At least 10 GIGSA members will be attending the 8th International Conference on Geosynthetics to be held in Yokohama, Japan from 18 to 22 September 2006, and most will be presenting papers. This is a great opportunity not only to showcase what we are doing in South Africa with geosynthetics, but also to learn about geosynthetic developments elsewhere in the world. I have been honoured to co-author one of the key note

addresses by our good friend Ed Kavazanjian on “Geosynthetic Barriers for Environmental Protection”, to convey the perspective of developing countries. As the South African contingent, we will try to cover as much of the conference as possible, in order to give a meaningful report back to our members at the GIGSA AGM later this year. There is still plenty of space at the conference for those who might still wish to register.

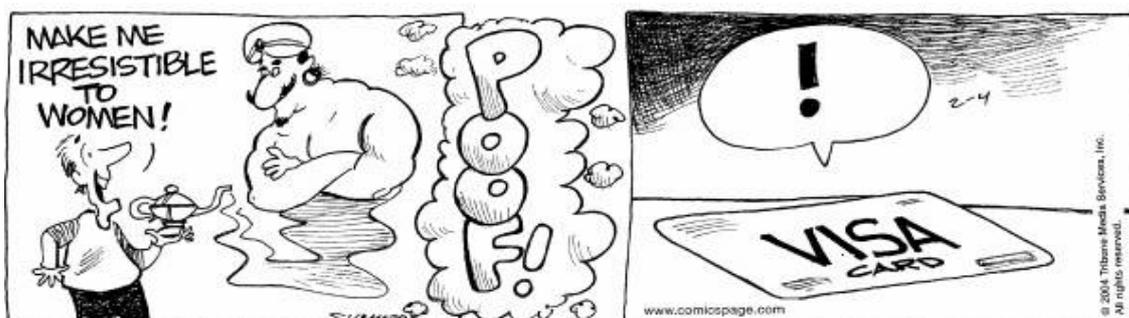
After the highly successful “Landfill 2005” Seminar held in KZN last October, the Central Branch Landfill Interest Group and GIGSA have already started planning for “Landfill 2007” to be held in early October next year, at a great venue near Johannesburg. In the tradition of “Landfill 2005”, we will again invite an eminent international geosynthetics personality to present the keynote address at “Landfill 2007”.

The IGS Council elections are being held at present, and I want to encourage all IGS members (GIGSA Individual members) to vote for their preferred officers for the next four years. Voting is by electronic ballot, which closes on 31 July 2006.

We will shortly be calling for nominations for election to the GIGSA Committee for 2007-2008. We really need some new and young blood on the committee, so please consider standing for committee. Our Annual General Meeting will be held on 23 October 2006, when the new committee will be announced. As stated earlier, we also intend giving a consolidated report back on the Yokohama Conference at the AGM.

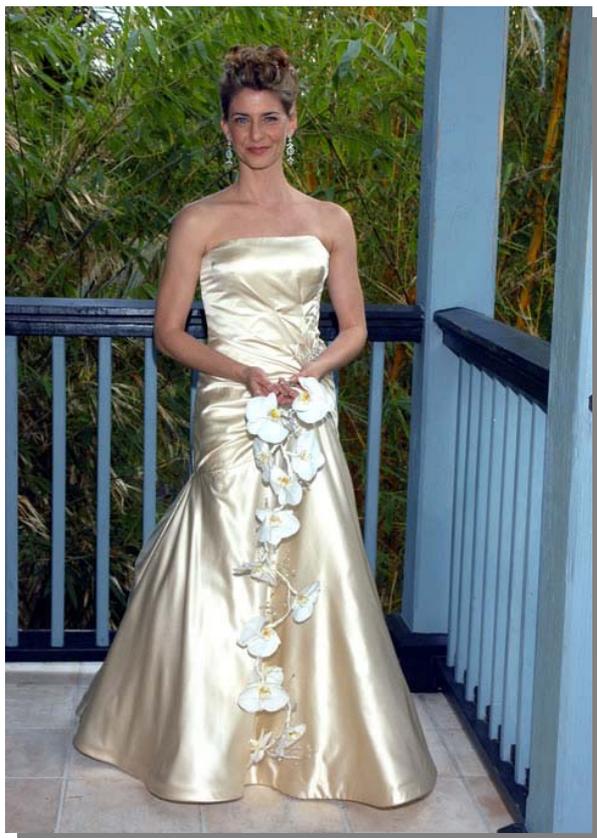
Enjoy this newsletter, and please submit articles of interest for future editions, as well as comments and suggestions for improvement.

Best wishes
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Ed's note: the VISA card in this picture is easily interchangeable with any of a variety of plastic charge cards and, of course: CHOCOLATE!

Wedding Belle



Mrs Lara Costa

GIGSA's heartiest congratulations to our web mistress Lara Costa and her lucky husband Ray. Lara has been responsible for designing and hosting our GIGSA web site (www.gigsa.org) and she took some time off recently to tie the knot with Ray. We wish them all the best for the future.

Labour-intensive geocell solutions

Kaytech's technical Marketing Director, Garth James, told GIGSA News that their *Multi-Cell* products are being used in a number of projects in South Africa and overseas, where several factors including durability, flexibility and cost-effectiveness have led to its success. He said that cost savings are largely brought about by Kaytech's patented Tension Frame® system which is incorporated into the panel design and simplifies installation, dispensing with the large number of locating pegs frequently required when laying out geocell installations.

The Amadiba Road

One of these projects was an aspect of the up-

grading of the Amadiba Road in the Eastern Cape, a 40-kilometre gravel link between the Bizana road and the Mntentu River Mouth. This was a poverty-alleviation project devised by the South African National Roads Agency (SANRAL). The road, a vital artery in the life of the people it



serves, had progressively deteriorated to the extent that it had become virtually impassable. The upgrading, which included the rehabilitation of 64 drifts, was carried out by unskilled or semi-skilled community members.

Six supervisors from the community were trained and each was responsible for upgrading their own section of road including the drifts. Each supervisor had their own team drawn from the community, and they (the supervisors) in turn, instructed their team members in the techniques to be used.



Construction of a drift on the Amadiba road

Garth says "This is an excellent illustration of how unskilled labour can play a major role in the installation of the product, resulting in a source of income for rural communities.

What the Amadiba Road community ended up with was employment, resulting in a good road incorporating functional, durable drifts.

The supervisors told us that in executing the work they felt increased self-esteem because the projects made positive contributions to their community, and they were part of making this happen”.



A completed drift

Consultant for the Client (SANRAL) was CSIR-Transportek, and the contractor was the Amadiba Community.

Deep Levels Landfill Closure

Similar work was done at the Deep Levels landfill closure project, albeit on a smaller scale. On this project *Multi-Cell* was laid in a ‘V’ drain to address erosion problems where an open channel drain at the toe at the northern slope of the landfill had been scoured by high-velocity storm-water coming off the landfill, as well as from a section of the adjacent village - to such an extent that it was barely serviceable.



Deep Levels before remediation

“To correct the situation and prevent further erosion,” says Garth, “a ‘V’ drain was designed, incorporating our *Multi-Cell* filled with 15-20 MPa concrete.

The channel was excavated and trimmed, and the workers who’d been trained for the work then installed *Multi-Cell* with a 100 mm wall high. Local, unskilled members of the neighbouring community carried out the *Multi-Cell* installation. They underwent one day of theoretical and prac-

tical training before they tackled the job, which they then executed very competently”.



Multi-Cell being laid and filled



The completed drain

“The use of the Tension Frame® system resulted in a minimum number of pegs being required to set the cells out, and shuttering was used on the outside edges of the V drain to provide a good finish. The concrete was placed and compacted into the cells and then brush-finished”.

Consultants for the Ekurhuleni Metro were Themba Consultants and the contractor was Moseme Road Construction.

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Alternatively, any Kaytech branch in Gauteng the Western Cape or kwaZulu-Natal.

Tension Frame Pat. No. 2003/03945

By all means marry. If you get a good wife, you'll be happy. If you get a bad one, you'll become a philosopher.

- Socrates

Closure and rehabilitation of a waste encapsulation area

The recent closure of one of the Enviroserv Holfontein hazardous waste disposal site's encapsulation cells has introduced new aspects to the design and safe closure of these long term storage facilities.

Waste encapsulation involves the encasement of specific types of hazardous waste in concrete to isolate them from the environment. No standards exist, however, for the closure and rehabilitation of encapsulation cells in the Department of Water Affairs (DWA) Minimum Requirements (MR) specification. Jones & Wagener (J&W), who are Enviroserv's Consulting Engineers at Holfontein, took an in-depth look at the long term integrity of this system, specifically the capping layer, and found it to be vulnerable to long term exposure to the atmosphere. Exposure to carbon dioxide (CO₂), water and oxygen results in the long-term deterioration of concrete by the following mechanisms:

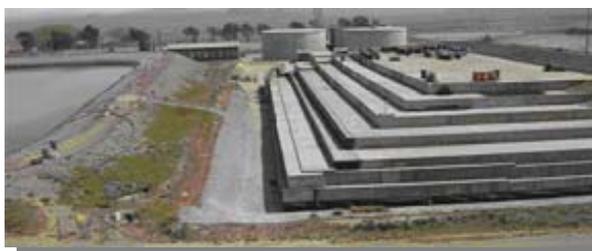
- CO₂ reacts spontaneously with the calcium hydroxide in cement hydration products to form calcium carbonate. This process is termed carbonation and results in the reduction of alkalinity of the concrete pore solution. The rate of carbonation inwards from the surface of the concrete to the encased steel depends on the quality of the concrete, its density and permeability, and the humidity of the atmosphere.
- Once the pH of the concrete pore solution around the encased steel drops, the steel which was in a passive state is now susceptible to corrosion if oxygen and water are present.
- As the steel corrodes, iron oxide is formed, which causes the outer layer of the steel to swell, which in turn generates tensile forces in the concrete and results in spalling of the outer layer of concrete.

Jonathan Shamrock, who was responsible for the design, comments: "J&W's design for the final closure of this cell therefore exceeded the specifications for a H:H capping specification as detailed in the Minimum Requirements, as it would not meet the long term closure objectives. The clay layers will desiccate and crack. Even if the cracks are small enough to keep water out of the cells, they will still allow a connection between the cells and the atmosphere, and thus

continue the process of depassivation"

The proposed capping system to meet the long-term closure objectives was presented to DWAF and approved. The system components can be summarised as follows (from the bottom to the top):

- A min 300 mm thick clay layer compacted in 150 mm thick layers. This layer acts as the cushion and levelling layer over the concrete encapsulation cells, as well as forming the primary clay liner. The layer was locally thickened on top of the cells to form drainage slopes and thus prevent ponding.
- A 1.5 mm double-textured HDPE liner. This liner was welded to the basal liner of the encapsulation cell so as to form an airtight liner system over the entire area. This layer forms the composite primary liner with the clay below. The liner is textured to ensure the stability of the veneer topsoil layer above it.
- A 500 mm thick topsoil layer. This layer allows for the establishment of vegetation over the area and, thus, the long-term erosion protection of the capping layers. It also surcharges the HDPE to ensure a composite action with the primary clay liner.



Encapsulation area completed

"Engineered Linings were contracted to cap this cell with a 1,5 mm thick HDPE liner, and to ensure the capping liner was welded to the basal liner to ensure an airtight seal".



The primary clay capping layer being placed to shape the cell

Due to the steepness and length of the side slopes of the cell, a Geogrid[®] soil-reinforcing

layer was required to further ensure that the topsoil cover soil layer would remain in place. J&W investigated the various geosynthetic grid reinforcing options available and designed the soil reinforcement layer to incorporate Secugrid® 30/30 Q6.



The 1,5 HDPE liner installed over the cell



The Secugrid® being positioned prior to topsoil covering



Topsoil cover being end tipped on top of the cell to anchor the slopes



Top of the cells had to be completed before the side slopes could be covered.

There are many soil reinforcement grids on the market, and most of these offer exceptionally high strengths. However, many of these high values are only reached after quite substantial elongation of the grid has taken place, at which

point the structure would already have failed. Secugrid® offers high strength at low elongation of 1% or 2%. Secugrid® has a very high modulus which means the product will 'take up' the stresses quickly with little or no movement in the overlying cover materials.

Jonathan continues; "Once the grid was placed on top of the HDPE liner, a 500 mm thick selected soil cover layer was placed over the cell. This will be seeded and grassed at the start of next wet season. The stormwater drainage system on top of the cell was designed to reduce erosion of the topsoil and assist in the overall slope stability. Seepage drains in the slope were also added to alleviate stress build up at the base of the slope due to seepage forces".

Overall, the design and construction of the cell sets new standards in the industry with regards to the way encapsulation cells are constructed.

For any further information on the project or the various products used during the construction, please contact:

- Jonathan Shamrock, J&W on 011 519 0200 (shamrock@jaws.co.za),
- Peter Hardie, Engineered Linings on 021 551 2430 (peterh@englining.co.za),
- John Coulson, Naue GmbH & Co. KG on 0949 57 41 40 08 28 (jcoulson.naue@btinternet.com).



The completed cell.

Seen in a shop window!



Laughter: the best medicine!



- 1 Raising teenagers is like nailing jelly to a tree.
- 2 Wrinkles don't hurt.
- 3 Families are like fudge... mostly sweet, with a few nuts.
- 4 Today's mighty oak is just yesterday's nut that held its ground.
- 5 Laughing is good exercise. It's like jogging on the inside.
- 6 Middle age is when you choose your cereal for the fibre, not the toy.
- 7 Growing old is mandatory; growing up is optional.
- 8 Forget the health food. I need all the preservatives I can get.
- 9 You're getting old when you get the same sensation from a rocking chair that you once got from a roller coaster.
- 10 It's frustrating when you know all the answers but nobody bothers to ask you the questions.
- 11 Time may be a great healer, but it's a lousy beautician.
- 12 Wisdom comes with age, but sometimes age comes alone.

We'd love to hear from you!

If you have an interesting article, case history, review, or anything you think would appeal to the GIGSA community, please submit it for review by the GIGSA News editorial team. Who knows—you may just see your name in print! For more information, please email Vanessa Davies at vanessa@axent.co.za



The four stages of life



- 1) You believe in Santa Claus.
- 2) You don't believe in Santa Claus.
- 3) You are Santa Claus.
- 4) You look like Santa Claus.

Freight companies we'd prefer not to use! (N^o. 2 in an ongoing series)

Editorial Guidelines

Please observe the following guidelines for submissions:

- Please ensure that articles are written in a professional technical style, and avoid "puffery" (a flattering commendation - especially when used for promotional purposes). GIGSA News will edit out any such content.
- There should be no product or company name in the title of the article. However, product, company or system names may be used and their benefits described in the text.
- Comparisons which purport to illustrate that a given organisation, product or type of product is superior to others on the market will be returned to the submitter for modification.
- Articles that present design or test methods that are related to only one product will not be acceptable.
- If an article includes images, please send these separately as JPG or GIF images, as well as including the images in the document to show preferred placement.
- Any images submitted without captions will not be used.
- Limit submissions to one A4 page where possible (including high-quality photographs and sketches - material that does not print well, or appear well on computer screens may be rejected).
- Longer articles may be considered if they are considered to be particularly interesting, but there is no guarantee that there will be space for such material in any particular publication.

- GIGSA News is published in two-column newspaper format, and is only issued electronically in Adobe PDF format. Please take this into consideration when composing your submission, as it does affect how it will appear onscreen, and in print.
- Articles will be accepted on a first-come first-placed basis, and this invitation to submit material is open only to paid-up GIGSA members.
- Parties wishing to submit an article should contact the editor and a guideline document on required layout will be sent.
- Please send all material to the GIGSA News Editor: vanessa@axent.co.za



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.