A Brief History of Geotextiles in South Africa

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ABSTRACT
Prior to 1972, there was only an occasional use of geotextiles (or filter fabrics, as they were originally known), in South Africa. Some imported nonwoven geotextiles had been used in a few filter and drainage applications.

The use of geotextiles really started in 1972 when the Kaymac Group of Companies, who, under the banner of their textile division Noel P Hunt, introduced a polyester, needle-punched, nonwoven product called bidim® into South Africa. This was imported from the manufacturers, Rhône-Poulenc of France. Noel Hunt had its head office in Pinetown Durban, and branches in Johannesburg, Cape Town, Port Elizabeth and East London. The product was enthusiastically marketed nationally to engineers and contractors in the civil engineering industry.

Amongst the early pioneers promoting geotextiles were Gavin McFarlane, (who initiated the introduction by bringing the original samples out from France, and guiding the promotion), Glen Lawson, Anthony Baker, Giraud Delorme, Brian Ashbury, Peter Davies, Jeremy du Plessis, Mike Dickson, Rudi Shmutz, John Smith and Don Lawson. A few of these individuals are still active today, locally and internationally.

Original trial of a geotextile carried out on a beach in Durban in 1972

Picture 1 - Stuck in beach sand

Picture 2 - Geotextile to the rescue!

Initially there was a large element of resistance to change, and the concept of a flexible polymeric fabric filter and separation product on a construction site was hard to accept, from both engineers and contractors!

A colleague, Peter Davies, stated the problem beautifully -

"To the engineers, the concept of replacing graded aggregate filters with a single layer of "filter cloth" was tantamount to a *Communist Plot* to undermine the tenants of sound engineering practice. " Terzaghi" ruled in as far as filter design was concerned, and that was that."

However, with perseverance, dedication, and sound technical development, the resistance barrier was slowly overcome. This slow acceptance in the early days would not have been possible without the valuable assistance of the more open minded and progressive engineers, whose names appear in the Addendum.

In 1973 an article by Dirk van Zyl (NITRR/CSIR) on the successful construction of a haul road over swampy ground in Richards Bay on the Natal North coast using geotextiles was published in the South African Institute of Civil Engineer's (SAICE) magazine "The Civil Engineer in South Africa". Subsequently the first major use of a geotextile over difficult soil by a Provincial Roads Department was the off ramp on the N3 into Pinetown Natal.

Picture 3 - Subsoil drain in Richards Bay 1973

Picture 4 - Off-ramp into Pinetown 1975

As more interest was shown in geotextiles, the established manufacturers from overseas saw a growing opportunity for applications and business in South Africa. These companies either entered or returned into the South African market.

- Fibertex ® - Denmark, marketed by the East Asiatic Company (George Strong),
- Polyfelt® - Chemie Linz/Austria & Trevira® - Hoechst/Germany, both marketed by the Transvaal Rubber Company (Mike Carolin and Cedric Stembridge),
- Typar® - DuPont/Luxembourg, marketed by Expandite (Brian Rossouw), and
- Terram® - ICI/UK, marketed by ICI/RSA (Pat Homan).

Later a local manufacturer of woven tapes, Industex, as well as two local staple filament products, Felt & Textiles and Romatex, also entered the geotextile market. At any given time, in tenders for contracts using geotextiles, there were at least two or three local, and three or four imported products being quoted.

This created quite some competition between all the suppliers, much to the concern of the design and specifying engineers, who in the early days had no experience and little knowledge of the technical aspects of these new geotextile products.

The engineers found it difficult to differentiate between the different types of geotextiles. They were not then covered by local specification, and the individual geotextile property data was in the hands of the suppliers, which certainly was not a satisfactory situation under the circumstances.

Because of the uncertainty, in some instances, in certain tenders or contracts, the solution adopted at the time, was to share the supply contract out with the different tenderers, irrespective of the product's technical differences!!

Up until that time the promotion of geotextiles was done by sales people who had been trained by the manufacturers. There was a gap between the engineers specifying or approving the geotextiles, and the sales people selling and supplying them. To try and improve the situation, Kaymac, now operating through their dedicated geotextile company Noel Hunt Geofabrics (NHG), started employing qualified Civil Engineers, Civil Engineering Technicians, and Engineering Geologists in their sales and marketing teams.

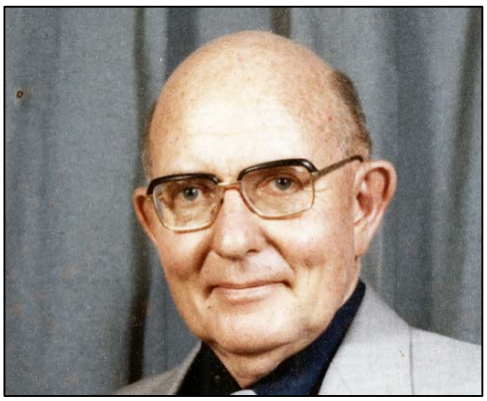
Thus personnel such as Glen Wittstock, Tony Howe, Colin Cleaver, Glen Hawkins, Juan Geldenhuys, Rod Claus, Lionel Gilbert, Paul Pratt, Garth James and Philip Jonker all joined the organization. After product training these technical sales persons visited the engineers, and their professional approach made a very positive difference to the acceptance of geotextiles.

Also in an attempt to improve technical knowledge in the field, annual presentations were given to final year civil engineering students at Universities and Technikons around the South Africa.

Later Noel Hunt Geofabrics (NHG) name was changed to Kaytech Engineered Fabrics, and as a matter of interest, at the time; they had the largest geotextile technical marketing and sales team in the world, employing approximately 50 personnel, excluding production staff.

In 1979 Prof Jean-Pierre Giroud, a geotextile specialist from the University of Grenoble in France visited the South African Dept Water Affairs & Forestry (DWAF), whose engineers such as Bill Legge (Chief Engineer) Frans Druyts, Frank Hollingworth, James Butler & Kobus Erasmus, (Design Engineers) were early pioneers and world leaders in using geotextiles in large earth and rock-fill dams.

During the early years they used in excess of one million square metres of geotextiles in applications under rip-rap, in blanket drains, in chimney drains (downstream) and toe drains.



Picture 5 - Bill Legge Chief Engineer DWAF

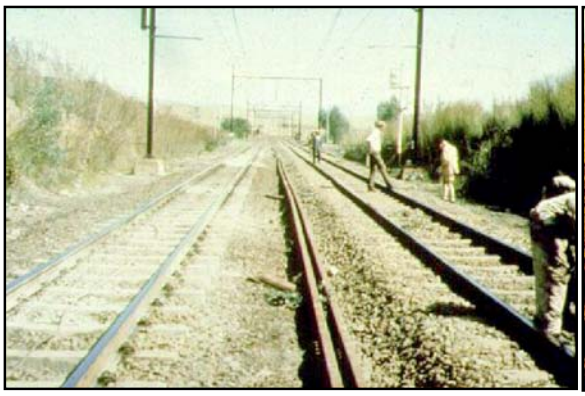
Picture 6 - Geotextile in Mokol Rockfill Dam

Picture - 7 Close up of filter system at Mokol Dam
(Photograph kindly supplied by Jean-Pierre Giroud)

Picture 8 - Geotextile in blanket & toe drains

The reason for showing a picture of Bill Legge, (amongst the so many other pioneering engineers who made a considerable contribution to geotextiles), is the demand for the large quantities of geotextiles his designs created. This in turn motivated the investment in a local nonwoven geotextile production facility, which made a major contribution to the early development of geotextiles in southern Africa.

Also during this time South African Railways & Harbours (SAR&H) were conducting full scale experiments with thick heavy geotextiles under rail track ballast, protected by a sand blanket, and geotextile wrapped side drains. The results showed good advantages over time when using the correct system.



Picture 9 - Without geotextile vs. with geotextile

Picture 10 - Geotextile – drainage gravel - formation

In later years the famous “Coal Line” from Mpumalanga in the Transvaal, to Richards Bay in Zululand used many thousands of square metres of geotextiles to protect this vital export rail link.

(One train, each with 2 to 3 locomotives and 200 x 40 ton trucks, giving a total of 8000 tons, moving over the rail line every hour)

Picture 11 - Completed rail construction

Picture 12 - Special “Coal Line” construction

By 1979 Kaymac had invested in a nonwoven geotextile plant, and were producing bidim® locally at their factory in Atlantis, North of Cape Town, under the management of Theunis Botha and Alun Goodrich. The factory had a SABS approved quality control laboratory which checked the product produced frequently as the process was continuous.

A comprehensive engineering reference library, with relevant data from all over the world, as well as a sophisticated laboratory for materials and geotextile application testing, was opened at Kaymac’s premises in Pinetown. The laboratory was very well equipped with specifically designed testing apparatus originated by the

late Colin Cleaver, then technical director. The use of both the library and the laboratory was free to all interested government departments and consulting engineers.

Picture 13 - Potential soil leaching tests

Picture 14 - Tensile testing

The South African Bureau of Standards (SABS), National Institute of Transport & Road Research (NITRR) as well as a number of Provincial Road Departments and Consulting Engineers made regular use of these specialised testing facilities.

This interest was spurred on by what came to be known as the first international conference on geotextiles in Paris France in 1977, and the later establishment of the International Geotextile Society (IGS).

All International Geotextile Conferences were attended by senior Kaymac staff, followed by comprehensive report back seminars through the SAICE branches in all major centres.

In the 1980's a committee was formed under the control and guidance of the SABS to develop the South African Standards for Geotextiles in South Africa. Participants included the Centre for Scientific & Industrial Research (CSIR), NITRR, DWAF, SAR&H, SAICE, Consulting and Design Engineers together with the Geotextile Suppliers. The result was the Code of Practice SABS 0221: 1988 "The Testing of Geotextiles".

The SAICE recognized the need for knowledge on geotextile filters to such an extent that in 1986 a very successful two day Filters Symposium was held in Johannesburg, with equal time dedicated to granular and natural filters.

Most importantly, at this stage, a number of well-respected local civil engineers had now studied geotextiles both locally and overseas, and were able to design and adjudicate independently of the suppliers influence. All these developments were a great stride forward.

Geotextiles in South Africa had at last become a respected and accepted part of civil engineering design!!

The International Geotextile Society (IGS) was now growing strong worldwide and a local Chapter was formed in South Africa in 1994. In this regard a lot of encouragement and assistance was received from Jean-Pierre Giroud and Guy Massenaux of the IGS in Europe. Later the Chapter's name was changed to the Geosynthetic Interest Group of South Africa (GIGSA) to follow the name change of the international body to the International Geosynthetic Society. This latter name change allowed for the various products being used that were not of textile origin.

Over time a number of international geosynthetic specialists such as Prof Jean-Pierre Giroud of Grenoble University France, Prof Alan McGown of Strathclyde University Scotland, Prof Kerry Rowe of Queens

University Kingston Canada and Bernard Myles of ICI/UK, amongst others, visited South Africa on geosynthetic lecture tours.

In the early days a number of technical papers on the use of geotextiles were written and published in various civil engineering magazines, amongst them being -

“Geofabrics used in the construction of a haul road over swampy ground in Richards Bay”
by Dirk van Zyl - NITRR/CSIR.

“Selection of Geofabrics for Filtration Applications with particular reference to Gold Tailings” by John Wates - Jones & Wagner & Glen Wittstock - Noel Hunt Geofabrics.

“Geotextiles Under Rail Track in South Africa” by Brian Hall & Ted Edgecombe - South African Railways & Harbours.

“Towards the Standardisation of Geotextile Test Methods and Parameters in South Africa” by Glen Wittstock - Noel Hunt Geofabrics, Dr Steve Emery - NITRR/CSIR & John Savage - Materials Engineer Natal Roads Department.

“Design of Geotextile Reinforced Bituminous Surfacing for Developing Areas.”
by Dr Steve Emery - NITRR & Paul Pratt – Noel Hunt Geofabrics.

A few interesting geotextile projects in South Africa

Picture 15 - Royal Alfred Marina construction

Picture 16 - Construction completed

Picture 17 - Damage from rough seas

Picture 18 - Repair with geocontainers

Picture 19 - Geotextile separation & drainage

Picture 20 - Paving fabric on road rehabilitation

Picture 21 - Geogrid reinforcement

Picture 22 - Geosynthetic Clay Liner (GCL)

The South African civil engineering fraternity is today up to world standards in the design and application of geotextiles and geosynthetics, and many large and interesting applications are being achieved.

Over the years since the establishment of the continuous filament needlepunched geotextile line, Kaytech has invested in various geosynthetic production facilities at their site in Atlantis. The latest developments have been the commissioning of a warp knit composite geogrid line, a needlepunched geosynthetic clay liner (GCL) line, a CMT (Cut Manufacture and Trim) line for assembling *inter alia* geocontainers, and a needlepunched staple-fibre geotextile line. At time of writing, this is the only geosynthetics manufacturing complex of this nature in Africa.

In conclusion, it should be stated that all the pioneering and innovative civil engineers of South Africa can be justifiably proud of their tremendous contribution to the early development of geotextiles and geosynthetics, not only in South Africa, but also world wide.

The writer's sincere thanks to his colleagues and those kind engineers with good memories who contributed to the information for this paper!!

…Addendum

ADDENDUM

Some pioneering engineers and others who contributed notably to the early development of geotextiles and other geosynthetics in South Africa (in no particular order).

GOVERNMENT, PROVINCIAL DEPARTMENTS & ACADEMIA.

Department of Water Affairs & Forestry.
Bill Legge, Frans Druyts, Frank Hollingworth, James Butler, Kobus Erasmus and later Kelvin Legge.

ESKOM Civil Engineering Department.
Ron Landby, Jeremy Boswell and duToit Viljoen.

National Institute for Transport & Road Research / CSIR.
Dr. Dirk van Zyl, Dr Steve Emery.

National Transport Commission (NTC).
Kees de Waal and Tony Lewis.

South African Bureau of Standards.
R H Watkins, Howard Vercoe and J L de Klerk.

South African Railways & Harbours.
Brian Hall, Ted Edgecombe, Stan Brown, Cedric “Cast Iron” Viljoen and Louis Prentzler.

Cape Provincial Administration - Roads Department.
Piet Myburgh and Etienne de Villiers.

Natal Provincial Administration Roads Department.
Ray Butler, “Puck” Healey, John Savage, “Mac” Jones, Brian Henwood, Mannie de Souza, “Mossie” Mostert Charlie George and Wally Bennet.

Durban City Engineers Department.
Peter Wallis, Keith Barnett and Dave Turner.

University of Natal - Civil Engineering Department.
Prof Ken Knight and Phillip Everett.

University of Pretoria - Civil Engineering Department.
Prof Phillip Savage (who coined the term “kunsveseldoek” as the Afrikaans name for “geofabric”) and Prof Alex Visser.

CONSULTING ENGINEERS

A A Loudon & Partners.
Allan Loudon, Leigh McQueen, and Alan Cook.

B S Bergman & Partners.
Ewan Duncan and Guy Paton.

Bradford, Conning & Partners.
Les Bradford, Robbie Dunbar and John Roux.

Bruinette, Kruger, Stoffberg & Hugo (Now BKS).
Dr Kobus Venter.

Hawkins, Hawkins & Osborne.
Roger Crooke and Terrence Bergman.

Hill, Kaplan, Scott & Associates.
Mike Taylor and Neil Carter.

Jeffares & Green.
Robbie Robinson and Colin Scott.

Jones & Wagener.
Dr Fritz Wagener and Danie Brink.

Liebenberg & Stander.
Angus Emslie, Alec Stewart and Alistair Bishop.

Mackintosh, Bergh & Sturgess.
Adrian Bergh and Frank Sturgess.

Ninham Shand & Associates.
Sandy Melville, Mike Shand, Dave Wright and Dave Rose.

O'Connell, Manthe & Partners.
Henry Campbell and Johnny de Korte.

Ove Arup.
Graham Plant and Malcolm Jaros

Robertson & Hitchins.
B Beckerling, John Morgan and Tim Freeman.

Saunders & Wium.
Noel Wium and Greg Sahd.

Scott & de Waal (Now SSI).
Wally Holzbach, Gordon Smyley and Colin Andrews.

Steffen, Robertson & Kirsten.
Dr Jack Caldwell, Dirk van Zyl, Gary Jones, John Robbertse, Mike Smith and Dave Bentel.

Strydom, Newmark & Anthony.
Rudi Boonstra and Hans Schaapers.

Van Niekerk, Kleyn & Edwards.
Alan Spence, Peter Hockey, Peter Squires and Rob Mc Morran.

Watermeyer, Legge, Piésold & Uhlmann (now Knight Piésold).
Ron Scheurenberg and Rob Williamson.

Wates & Wagner.
John Wates and Fred Gassner

CIVIL ENGINEERING CONTRACTORS & SUPPLIERS

River & Sea Gabions (Now Maccaferri).
Mark Tanner.

Afrocon Construction.
Doug Littler, Colin Cowper, Donald Gray and Ian Wilkes.

Basil Read.
Mike Bain-Venn and Russell Warman.

Fraser Alexander.
Mike Gowan, John Cayanis and Ron Jones.

Grinaker Construction.
Graham Saunders, Derek White and Colin Fowles.

Savage & Lovemore
Rick Mundy and Wayne Godfrey.

Van Leer / Netlon (Now Huhtamaki).
Monty Munstermann, Graham Randall and Laurie Johnson.

Note

My apologies for any names omitted. Any such would purely be attributable to a failure in my Memory Retrieval System!!