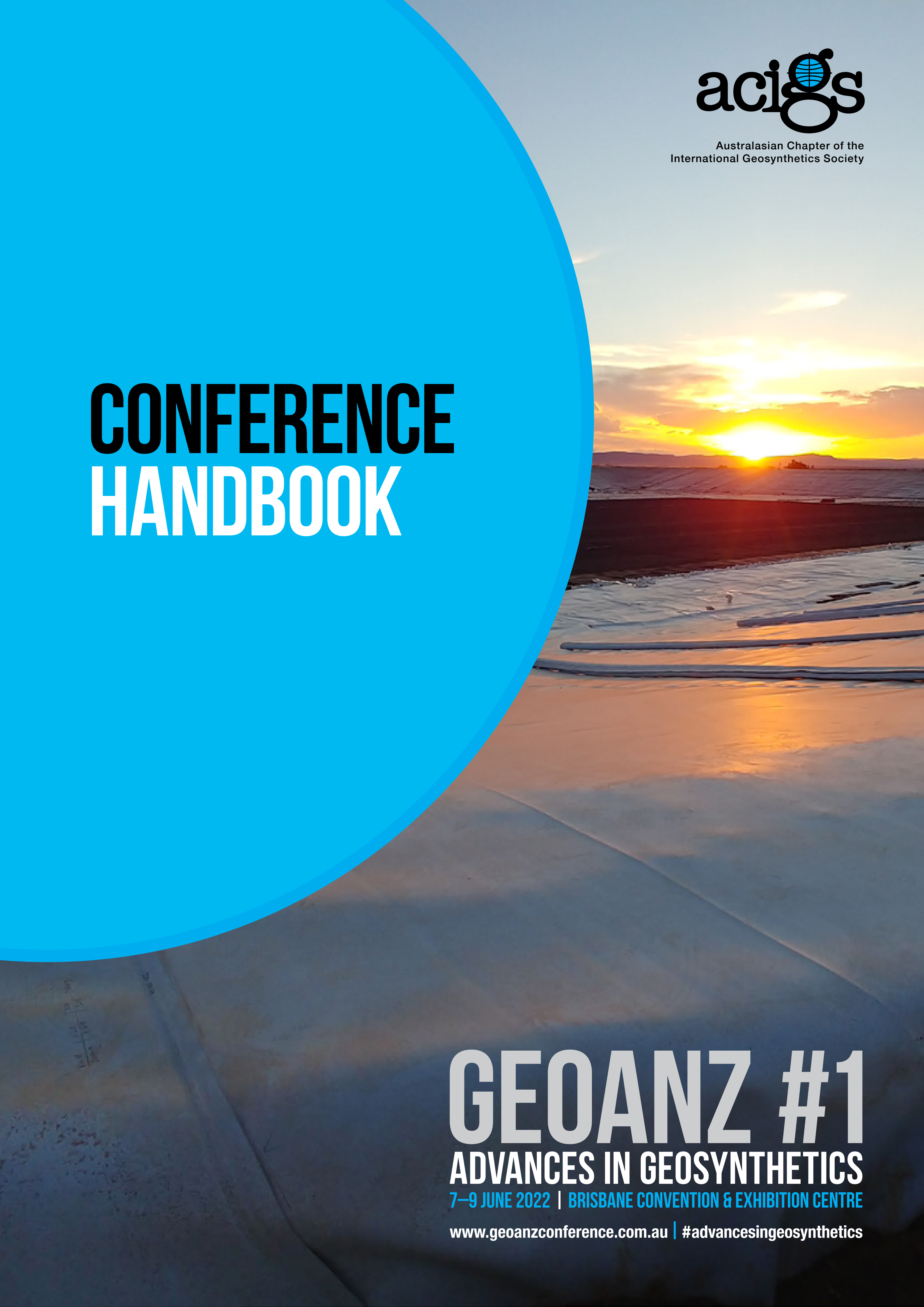


acigs

Australasian Chapter of the
International Geosynthetics Society

CONFERENCE HANDBOOK

GEOANZ #1

ADVANCES IN GEOSYNTHETICS

7–9 JUNE 2022 | BRISBANE CONVENTION & EXHIBITION CENTRE

www.geoanzconference.com.au | #advancesingeosynthetics

THANK YOU TO OUR GOLD SPONSORS

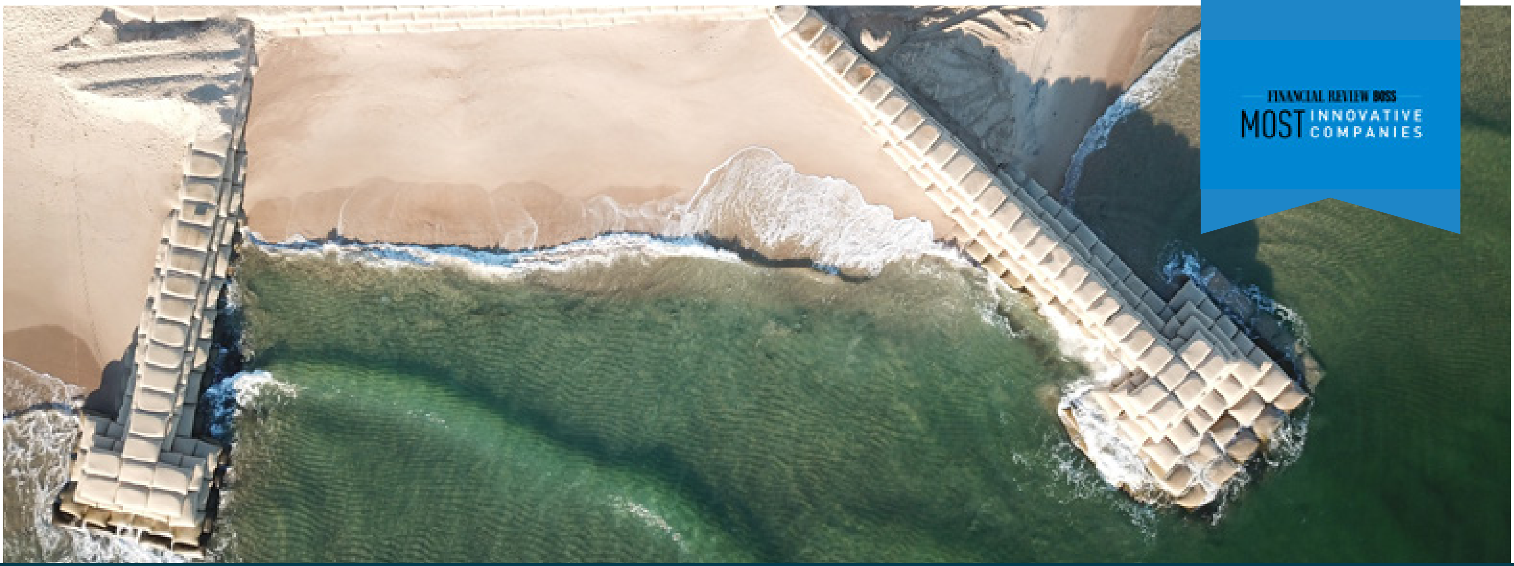
GOLD SPONSORS

FABTECH
FLEXIBLE GEOMEMBRANE LINERS & COVERS
PROTECTING THE ENVIRONMENT

GEOFABRICS®
Sustainable solutions

Global Synthetics
LEADERS IN GEOSYNTHETICS

HUESKER
Ideas. Engineers. Innovations.


FINANCIAL REVIEW BOSS
MOST INNOVATIVE COMPANIES

WELCOME FROM THE CONVENOR

On behalf of the organising committee, it is my pleasure to welcome you to the GEOANZ #1 Conference in Brisbane, Queensland from 7th to 9th June 2022.

This will be the inaugural GEOANZ Conference – a geosynthetics conference organised by the Australasian Chapter of the International Geosynthetics Society (ACIGS).

The theme of the conference is **Advances in Geosynthetics** and includes several sub-themes, including mining, environmental containment, coastal protection, infrastructure reinforcement and stabilisation. With its combination of keynotes, presentations and workshops, the conference promises to be an excellent learning opportunity.

Beyond the learning, the Conference is an important meeting place for fellow professionals. We are thrilled that we have attendees from as far as Canada, Malaysia, New Caledonia, South Africa, the UK, Thailand, Austria, USA, New Zealand, as well as our Australian contingent. This is an outstanding result for our inaugural conference; and we know that our community will celebrate the return of meeting in person.

Thank you to our sponsors and exhibitors. Again, we are thrilled with the response from our industry. I encourage you to take the time to build new relationships or catch up with colleagues.

I would like to acknowledge the support of the organising committee and their efforts in bringing this conference together.

Thank you also to our distinguished speakers who are joining us for this conference. We are looking forward to sharing the knowledge.

I hope I have the opportunity to meet everyone at the conference. Thanks for joining us, it's going to be a great few days.

Siamak Paulson
GEOANZ #1 Conference Convenor
President, ACIGS

CONFERENCE COMMITTEES

ORGANISING COMMITTEE

SIAMAK PAULSON

JONATHAN SHAMROCK

RYAN HACKNEY

GRAHAM FAIRHEAD

BRENDAN SWIFTE

PROGRAM COMMITTEE

- Katie Bocskor – Presto Geosynthetics
- Morne Breytenbach – Huesker
- Celia Chen – Huitex
- Raymond Chow – Polyfabrics
- Andrew Crisafulli – Solmax
- George Fannelli – Global Synthetics
- Dennis Grech – Geofabrics
- Su Jong Hao – Solmax
- Warren Hornsey – TRI
- Preston Kendall – Axter
- Colin Lim – Naue
- Christian Lisle – GreenTec Consulting
- Attila Marta – Red Earth Engineering
- Kyle McClintock – ADE Group
- Rob Mcilwraith -Axter
- Nick Morris – GeoQ
- Nilay Patel – SKAPS
- John Scheirs -ExcelPlas
- Amir Shahkolahi – Global Synthetics
- John Smith – TenCate
- Jake Stoyle – Naue
- Edoardo Torres – Atarfil
- Andy Warwick – Global Synthetics

TECHNICAL COMMITTEE

- Jonathan Shamrock – Tonkin & Taylor Ltd
- Siamak Paulson – ADE
- John Cowland – Geosystems Ltd
- Warren Hornsey – TRI
- Boyd Ramsey – Boyd Ramsey Consulting
- Timothy Stark – University of Illinois
- Craig Benson – University of Wisconsin-Madison
- Erol Tutumluer – University of Illinois
- Abdelmalek Bouazza – Monash University
- Attila Marta – Red Earth Engineering
- Yolanda Thorp – Tonkin & Taylor Ltd

OUR PRESTIGIOUS SPEAKER

PROFESSOR J.P. GIROUD

Professor J.P. Giroud will present a lecture in our Master Class #1.

Dr. Giroud, a former professor of geotechnical engineering, is a consulting engineer under JP GIROUD, INC., and Chairman Emeritus and founder of GeoSyntec Consultants. Dr. Giroud is chairman of the editorial board of Geosynthetics International and past president of the International Geosynthetics Society (the IGS). He has authored over 400 publications, and has lectured worldwide. Dr. Giroud coined the terms "geotextile" and "geomembrane" in 1977. He has developed many of the design methods used in geosynthetics engineering and has originated a number of geosynthetics applications, in particular for landfills, reservoirs and dams. In 1994, the IGS named its highest award "The Giroud Lecture", "in recognition of the invaluable contributions of Dr. J.P. Giroud to the technical advancement of the geosynthetics discipline". A Giroud Lecture is presented at the opening of each International Conference on Geosynthetics by a lecturer selected by the IGS Council. In 2002, Dr. Giroud became Honorary Member of the IGS with the citation "Dr. Giroud is truly the father of the International Geosynthetics Society and the geosynthetics discipline". In 2005, Dr. Giroud has been awarded the status of "hero" of the Geo-Institute of the American Society of Civil Engineers (ASCE) and has delivered the prestigious Vienna Terzaghi Lecture. In 2005-2006 he presented the Mercer Lectures, a prestigious lecture series endorsed jointly by the IGS and the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). In 2007, Dr. Giroud was made Doctor Honoris Causa of the Technical University of Bucharest, Romania. In 2008, J.P. Giroud delivered the prestigious Terzaghi Lecture of the ASCE. In 2009, Dr. Giroud has been elected member of the US National Academy of Engineering. In 2010, he has been appointed Chevalier in the Order of the Légion d'Honneur. In 2016, Dr. Giroud has delivered the Victor de Mello Lecture of the ISSMGE. Dr. Giroud has 55 years of experience in geotechnical engineering, and, in 47 years since 1969, he has worked more than 100,000 hours on geosynthetics.

OUR DISTINGUISHED SPEAKERS

PROFESSOR CRAIG BENSON

Proudly sponsored by

GEOFABRICS
Sustainable solutions

Craig Bensons expertise falls in the discipline referred to as geoenvironmental engineering. This discipline is at the interface of the built and natural environments, and deals with issues in the subsurface or interactions between conditions at the earth's surface and the subsurface. He is a Dean of the School of Engineering and the Hamilton Endowed Chair in Engineering at the University of Virginia(UVA)

Craig has been conducting research related to protection of the environment for three decades, with primary focus on environmental containment of solid, hazardous, radioactive, and mining wastes; beneficial use of industrial byproducts; and sustainable infrastructure. He is recognized as a foremost international authority on waste containment systems, and is widely sought after for his expertise in design, operation, and performance assessment of waste disposal facilities.

PROFESSOR MALEK BOUAZZA

Dr A (Malek) Bouazza is a Professor of Civil Engineering at Monash University. He is a Visiting Distinguished Professor at Zhejiang University, China. He has also held a number of visiting scholar positions at Cardiff University, U.K., University of Missouri-Columbia, USA, Arizona State University, USA, University of Malaysia-Pahang, Malaysia and Queen's University, Canada.

His skills and experience in the area geosynthetics and environmental geotechnics are well recognized in Australia and abroad. In addition to his academic commitments, Dr Bouazza gives specialist advice for the industry both nationally and internationally. His work has included peer review of design for more than 30 municipal solid waste and hazardous landfills and tailings storage facilities in Australia, Thailand, Peru and other countries. He has led and co-wrote the key liner components of new landfill standard (Best Practice Environmental Management: Siting, design, operation and rehabilitation of landfills, EPA Publication 788) for the State of Victoria, Australia which is now used as a model for much of the country. Dr Bouazza has been a key advisor to EPA Victoria on landfill design and operation and has been appointed in 2015 to the EPA Victoria independent landfill expert panel to provide peer review advice on complex landfill proposals to improve the efficiency and certainty associated with landfills approval process. He has performed, in this capacity, peer review of the lining design of most of the major landfills in Victoria. He has provided expert advice on numerous challenging projects ranging from the long-term performance of landfill liners for municipal solid waste and hazardous waste in Australia and in Antarctica; shale gas migration through liners in the USA, Cut off walls to mitigate mercury vapour intrusion in Australia, lining for coal seam gas facilities in Australia and liners for mining applications in Peru, South Africa, and Australia.

HUESKER

Ideas. Engineers. Innovations.

Ecological Sustainability with Geosynthetics

HUESKER Australia Pty Ltd
office@HUESKER.com.au | www.HUESKER.com.au

ONE TREE PLANTED

OUR DISTINGUISHED SPEAKERS

MR JOHN COWLAND

John Cowland is a Geotechnical and Geosynthetics Engineering Consultant, based in Hong Kong, China, with over 40years of experience. He has provided advice to more than 60government and private sector clients throughout the Asia Pacific region on geotechnical, environmental and geosynthetic projects; including solid waste landfills, tunnels, mines, dams, deep excavations, soil slopes, rock slopes, coastal reclamations, soft ground, foundations, liquid storage and disposal of contaminated soil. He has advised on the use of geosynthetics in all these areas, often in an innovative manner. John has also provided advice on project management for tunnelling, water supply and environmental projects up to US$ 12billion in value. He has published over 50technical papers on Geotechnical Engineering and Geosynthetics. John was a Council Member of the IGS from 2000 to 2014. He is a Member of the Environmental Geotechnics Committee TC 215 and the Tailings and Mine Waste Committee TC 221 of the International Society for Soil Mechanics and Geotechnical Engineering and he is a Past Chairman of the Association of Geotechnical and Geoenvironmental Specialists Hong Kong.

MR BOYD RAMSEY

Proudly sponsored by

SOLMAX

Boyd Ramsey has been an active participant in the geosynthetics industry for over three decades. He now operates a sole-proprietor consultancy and spent much of his career with GSE Environmental (now Solmax) in a variety of global assignments. He has served in chairmanships and leadership positions with IGS, GMA, the Geosynthetic Institute and in other industry trade and technical groups including the IGS Technical Committee for Barrier systems and the IGS Sustainability Committee. He has been fortunate to travel and live in many parts of the world. More information can be found on his website is BoydRamseyConsulting.com

PROFESSOR TIMOTHY STARK

Proudly sponsored by

red earth engineering

Dr. Timothy Stark is a Professor of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign. Dr. Stark has been conducting interdisciplinary research on geosynthetics, and in particular geomembranes, for the last twenty-five (25) years. This includes his research on the installation and long-term durability of geomembranes and other geosynthetics in geo-environmental and the static and seismic stability of landfill liner and cover systems. His research on the static and seismic stability has led to a better understanding of design geosynthetic interface strengths, the importance of interim slope conditions in landfill operations, and the shear behavior of various geosynthetic interfaces. He is also the Technical Director of the Fabricated Geomembrane Institute (FGI), which is an industry sponsored research organization investigating the advantages and disadvantages of geosynthetics for containment applications.

Safe landfill with Bentofix X

Date: March 2020
Location: Heritage Park, QLD

Project Background

The Browns Plains Waste and Recycling Facility is one of the most advanced and innovative waste facilities in Queensland. It offers both landfill and recycling facilities. The facility is dedicated to minimising the risk to locals and the environment by reducing gas emissions, avoiding groundwater contamination, and reducing the space utilised by the landfill.

Problem

The designer needed to develop a plan for providing a cost effective low permeable lining system based on the latest available technologies. In addition, it has to be ensured that the chosen system would meet local landfill guidelines. Most importantly, they needed to control potential risks to ensure that any potential pollutants were addressed.

Solution

After reviewing different options and completing a risk based assessment of the preferred options, the use of a PE-coated GCL was selected and approved as the final lining system. Bentofix® X5F NSP4900 over a 300mm compacted clay layer was chosen as the most suitable choice, providing extremely low permeability and a range of other benefits.

The lining system was then protected with a nonwoven cushion geotextile and covered with 300mm drainage aggregate. Furthermore, a reinforcement geogrid was used on top of the cushion geotextile in the batters in order to provide the required stability for the drainage gravel.

Bentofix® X5F NSP 4900 a needle punched GCL with 500g/m^2 of extra Polyethylene (PE) coating applied to the GCL surface as a hot melt fluid during the manufacturing process. This allows the PE coating to become a part of the GCL as one of its components and provide an integrated high-performance multi-component lining system with extra advantages compared to standard non-coated GCL.

Some of the extra advantages that Bentofix® X5F NSP 4900 provides include:

- 1,000 times lower permeability compared to a standard non-coated GCL, and 100,000 times lower permeability compared to compacted clay.
- Protection against desiccation (e.g., in low confinement applications such as landfill caps, landfill batters, leachate ponds, etc.)
- Protection against downslope bentonite erosion (e.g., on exposed batters beneath a geomembrane)
- An instant gas barrier (e.g., landfill caps)
- A root barrier (e.g., landfill gas)

Bentofix® is the first and original needle-punched GCL innovated and produced by German manufacturer Naue since 1987. It has been used in a range of Australian projects since 1994, providing high-quality long-term solutions many times over.

Bentofix® GCL fulfils the performance and permeability requirements of national and international GCL specifications and is an approved GCL product by environmental agencies (EPAs) including DES in QLD. It has been successfully used in various environmental projects such as landfills, contaminated lands, mining, and tailings dams, and in oil and gas applications.

The suggested design provided a significant reduction in costs, carbon footprint and construction time.

For further information please contact:

Naue Asia Sdn Bhd
Jake Stoyle
M +601-2937 2710
T +603-8959 1333
jstoyle@naue.com
naue.com

Global Synthetics
Chris Smith
T +61 2 9725 4321
M +61 421 854 503
chris@globalsynthetics.com.au
globalsynthetics.com.au




OUR DISTINGUISHED SPEAKERS

PROFESSOR DAVID WILLIAMS

Professor David Williams initiated and directs the industry-funded Geotechnical Engineering Centre at The University of Queensland in Brisbane, Australia. He has over 40 years of teaching, research and consulting experience, and is internationally recognised for his expertise and experience in mine waste management and mine closure. He is particularly recognised for his expertise in tailings, and the design, construction, operation, closure and rehabilitation of tailings dams and waste rock dumps, including the design of covers. He authored in 2009 and 2016 the Tailings Management Handbook, as part of the Commonwealth Leading Practice Sustainable Development Program for the Mining Industry, and is on the Working Party for the Australian National Committee for Large Dams Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure, published in 2012, with an Addendum in 2019, and currently under revision.

PROFESSOR JORGE ZORNBERG

Proudly sponsored by

acigs

Jorge G. Zornberg is the Brunswick-Abernathy Regents Professor in the geotechnical engineering program at the University of Texas at Austin. He has over 35 years' experience in geotechnical and geoenvironmental engineering. He is also one of the pioneers of geosynthetics. Jorge earned his M.S. from PUC-Rio (Rio de Janeiro, Brazil) and his Ph.D. from the University of California at Berkeley. In 2001, Zornberg received the Presidential Early Career Award for Scientists and Engineers under the National Science Foundation.

Zornberg was president of the International Geosynthetics Society from 2010 to 2014. Also, he chaired the Technical Committee on Geosynthetics of the Geo-Institute of ASCE (2015-2020). Prof. Zornberg has authored over 450 technical publications.

Zornberg participated in the design of retaining walls, transportation facilities, mining lining systems and hazardous water containment facilities as a consulting engineer. He also conducts research on geosynthetics, soil reinforcement, unsaturated soils, liner systems and numerical modeling of geotechnical and geo-environmental systems as part of his academic experience.

CONFERENCE PROGRAM

GEOANZ #1 ADVANCES IN GEOSYNTHETICS

CONFERENCE PROGRAM

TUESDAY 7 JUNE 2022 — DAY1

12noon	**Registration Desk open** Plaza Level foyer, Grey Street entrance, Brisbane Convention & Exhibition Centre		
MASTER CLASSES Pre-registration required to attend The Master Class.			
	PLAZA ROOM 6	**PLAZA ROOM 7**	**PLAZA ROOM 8**
1.00pm–5.00pm	**MASTER CLASS 1**	**MASTER CLASS 2**	**MASTER CLASS 3**
	Convenors | Professor JP Giroud, Professor Malek Bouazza & Mr Boyd Ramsey	Convenor | Professor Jorge Zornberg	Convenors | Professor Craig Benson, Professor Timothy Stark & Professor David Williams
	Advances in Design and Construction with geosynthetics for Hydraulic Structures and Environmental Containment Speakers | Abigail Beck, John Cowland, Fred Gassner, Daniel Gibbs, J P Giroud, Gus Martins, Jake Stoyle *Proudly sponsored by* FABTECH	**Advances in Design and Construction with geosynthetics for Retaining Structures, Slopes, and Roadways** Speakers | Rajesh Bhavsar, Allan Garrard, Chris Lawson, Amir Shahkolahi *Proudly sponsored by* Global Synthetics	**Advances in Design and Construction with geosynthetics for Mine Tailings and Closure Applications** Speaker | Pascal Saunier *Proudly sponsored by* AXTER AUSTRALIA
5.30pm–7.30pm	**Welcome Reception at South Beach, South Brisbane** A ticket to the Welcome Reception is included in full registrations only.		*Proudly sponsored by* TRI AUSTRALASIA

MASTER CLASSES

MASTER CLASS #1	MASTER CLASS #2	MASTER CLASS #3
Advances in Design and Construction with geosynthetics for Hydraulic Structures and Environmental Containment	**Advances in Design and Construction with geosynthetics for Retaining Structures, Slopes, and Roadways**	**Advances in Design and Construction with geosynthetics for Mine Tailings and Closure Applications**
FABTECH FLEXIBLE GEOMEMBRANE LINERS & COVERS PROTECTING THE ENVIRONMENT	Global Synthetics LEADERS IN GEOSYNTHETICS	AXTER AUSTRALIA
Convenor: Professor JP Giroud, Professor Malek Bouazza & Mr Boyd Ramsey	**Convenor:** Professor Jorge Zornberg	**Convenor**: Professor Craig Benson, Professor Timothy Stark & Professor David Williams
Speakers: Abigail Beck, John Cowland, Fred Gassner, Daniel Gibbs, Gus Martins, Jake Stoyle	**Speakers:** Rajesh Bhavsar, Allan Garrard, Chris Lawson, Amir Shahkolahi	**Speakers:** Pascal Saunier
Topic	**Topic**	**Topic**
Introduction	Introduction	Introduction
Topic 1: Liquid and Gas Depressurisation in Storages	**Topic 1:** Geosynthetic-reinforced Soil Walls	**Topic 1:** Liners and covers for mine waste applications – Aussie experience
Topic 2: Factors in Geomembrane leakage – reasonable expectations, historical data and calculations	**Topic 2:** Embankments on Soft Foundations	**Topic 2:** GCLs in liner systems for mine waste applications
Sponsor Case Study	**Sponsor Case Study**	**Sponsor Case Study**
Refreshment Break	Refreshment Break	Refreshment Break
Gas and Liquid Barrier using MGCL system		
Topic 3: Emerging contaminants in temporary repositories and in solid and liquid containment facilities	**Topic 3:** Geosynthetic-reinforced Load Transfer Platforms	**Topic 3:** Geosynthetics for tailing disposal facilities: containment and stability
Topic 4: Wind uplift – updated calculations, factors for consideration and analysis and use of mechanical fasteners	**Topic 4:** Geosynthetics in Roadways	**Topic 4:** Tailings drainage using multilinear drainage geocomposites
Topic 5: Water flow over geosynthetic liners	**Topic 5:** Geosynthetics in Railways	**Topic 5:** Geosynthetics for Evaporation mining
Q and A / Wrap up	Q and A / Wrap up	Q and A / Wrap up

CONFERENCE PROGRAM

WEDNESDAY 8 JUNE 2022 DAY2

7.30am–8.45am	**Breakfast Sessions** Invitation only	*Proudly sponsored by*
8.00am–5.00pm	**Registration Desk open**	
8.00am–5.00pm	**Exhibition open** Come and visit your industry colleagues. We have 20 exhibitors who have supported GEOANZ #1	*Barista cart available, proudly sponsored by*
9.00am	**Welcome Address** from Convenor, Siamak Paulson, President, ACIGS	
9.10am	**PLAZA ROOM 10/11** Keynote presentation | Prof Jorge Zornberg **The Resourcefulness of Geotechnical Design when adopting Geosynthetics**	*Proudly supported by*
10.10am–10.40am	**Morning Refreshments** & opportunity to meet the sponsors and exhibitors	*Proudly sponsored by*

CONCURRENT SESSIONS

	PLAZA ROOM 10 & 11	PLAZA ROOM 7 & 8
	Session 1 .1 | Advances in Geosynthetics for Geo-environmental Application Chair | Mr Boyd Ramsey *Proudly sponsored by*	**Session 2.1 | Advances in Geosynthetics for Reinforcement and Stabilisation** Chair | Mr Jonathan Shamrock *Proudly sponsored by*
10.40am	Abigail Gilson, Tri Environmental **Understanding Dipole Method Testing Results**	Chaminda Gallage, Queensland University of Technology (QUT), Brisbane, Queensland, Australia **Field evidence on the effectiveness of the geogrid/geocomposite reinforcement in reducing induced stress on weak subgrades**
11.00am	Attila Marta, Red Earth Engineering **Brittle Stress Cracking of HDPE Geomembrane Caused by Localised OverHeating of Fusion Wedge Welds**	Allan Garrard, CMW **Design and Construction Challenges for a 27m High ROM Retaining Wall**
11.20am	Lukas Peham, Institute of Polymeric Materials and Testing – Christian Doppler Laboratory – University Linz **Global ageing behaviour of a polypropylene random copolymer geomembrane with phenolic antioxidants**	Jeroen Berends, Geoinventions Consulting Services Pty Ltd **A Performance-Based Design for Large Reinforced Soil Structures and Risk Control Process During Construction**
11.40am	Craig Brock, ADE Consulting Group **Encapsulation of Insitu Contamination using an Innovative Geosynthetics Solution**	Abid Ali, Geofabrics Australasia **The bearing capacity of a granular layer on weaker sand and the benefits of mechanical stabilisation**

CONFERENCE PROGRAM

12.00pm	Warren Hornsey, TRI Australasia **Geotextile Protection Efficiency - The relationship between confining pressure and geotextile mass**	Phil Ball, Tencate Geosynthetics Asia **Innovative Moisture-Managing Reinforcement Geosynthetic for Mechanical and Hydraulic Stabilization**
12.20pm–1.20pm	**Lunch** & opportunity to meet the sponsors and exhibitors	
	PLAZA ROOM 10 & 11	**PLAZA ROOM 7 & 8**
	Session 1.2 | Advances in Geosynthetics for Geo-environmental Application Chair | Mr Mike Sadlier	**Session 2.2 | Advances in Geosynthetics for Reinforcement and Stabilisation** Chair | Mr Sam Allen
1.20pm	Elissar Mikhael, Monash University **Sorption of Per- and Poly-Fluoroalkyl Substances onto the Geotextile Components of the Geosynthetic Clay Liner**	Michael Sorensen, Cirtex Industries Ltd **Evaluating the benefits of geogrid in pavement and foundation applications with onsite testing**
1.40pm	Damien Moodie, Ade Consulting Group **Overview of the advances in Geocomposites for the containment of PFAS impacted materials**	Kourosh Kianfar, ADE Consulting Group **Flexible Reinforced Soil Wall**
2.00pm	J.P. Lens, Cooley Group **New developments in prevention and protection of water resources. Why PVCEIA alloys are the best choice for long-term, improved performance**	Colin Lim, Naue Asia **Ultimate resistance of geogrid-reinforced working platforms for tracked plant over cohesive subgrade**
2.20pm	Preston Kendall, Axter Australia **Advances in Bituminous Geomembrane Welding Methodology**	Matteo Lelli, Maccaferri Malaysia **Use of site-won soil for reinforced soil soil slopes and walls**
2.40pm	Darren Webb, Golder WSP **Design of liner system for bauxite residue storage system in desert environment**	JP Theron, Huesker Australia **Use of Asphalt Reinforcement in Heavily Loaded Container Terminal Pavements**
3.00pm–3.30pm	**Afternoon Refreshments** & opportunity to meet the sponsors and exhibitors	
	PLAZA ROOM 10 & 11	**PLAZA ROOM 7 & 8**
3.30pm–4.30pm	**Keynote Panel | Prof Malek Bouazza & Mr John Cowland**	**Keynote Panel | Prof Jorge Zornberg**
4.30pm–5.30pm	**Poster Session** & opportunity to view the posters and meet the authors	
7.00pm–10.30pm	**Conference Dinner & Awards** Level 12, Rydges South Bank Brisbane Hotel	*Proudly sponsored by* AXTER

CONFERENCE PROGRAM

THURSDAY 9 JUNE 2022 DAY3

8.00am–4.00pm	**Registration desk open**	
8.00am–5.00pm	**Exhibition open** Come and visit your industry colleagues. We have 20 exhibitors who have supported GEOANZ #1 *Barista cart available, proudly sponsored by* ATARFIL geomembranes	
8.45am–8.50am	**Welcome Day 2**	
8.50am–9.50am	Keynote presentation | Prof Craig Benson **Lessons Learned for the Practicing Engineer: How and When Geosynthetic Clay Liners are Effective for Containment** *Proudly sponsored by* GEOFABRICS Sustainable solutions	
9.50am–10.20am	**Morning Refreshments** & opportunity to meet the sponsors and exhibitors	
	PLAZA ROOM 10 & 11	**PLAZA ROOM 7 & 8**
	Session 3.1 | Advances in Geosynthetics for Mining Chair | Mr Siamak Paulson *Proudly sponsored by* red earth engineering	**Session 4.1 | Advances in Geosynthetics for Sustainability, Durability and Innovation** Chair | Mr Fred Gassner
10.20am	Charles Vuillier, Mincore **Using Geotubes for improving the safety of tailings storage facilities and reducing footprint**	Zehra Kaya, Huesker Australia **A modern approach to traditional geotextile seals: An advanced chipseal grid for highperformance reinforced sprayed seals and field verification in Australia**
10.40am	Hermann Ng, Solmax Geosynthetics Co. Ltd. **Use of HDPE Vertical Barrier Wall for Remediation of Hazardous Waste Dumpsite**	Jong Hao Su, Solmax Geosynthetics Sdn. Bhd. **Effective geosynthetics solution for pit thermal energy storage**
11.00am	Bilal Enes Taskesti, Monash University **Hydration Behavior of Geosynthetic Clay Liners (GCLs) Manufactured with Laboratory Type Needle Punching Equipment**	Tom Sangster, Downley Consultants Ltd **The Role of Geosynthetics in Combatting the Effects of Global Warming**
11.20am	Pascal Saunier, Afitex-texel Geosynthetics Inc. **A sensitive mine closure in Canada – analysis after 15 years of completion using a multi-linear drainage geocomposite for surface water collection**	Elham Soleimani, Monash University **A short overview of microplastics and nanoplastics presence in landfill leachate**
11.40am	Liza Du Preez, WSP Golder **Sino Iron Case Study: Changing from Composite PE liner system to BGM**	Mike Sadlier, GCA **Liners and Covers for Reservoirs – Evaluation and Replacement**
12.00pm–1.00pm	**Lunch** & opportunity to meet the sponsors and exhibitors	

CONFERENCE PROGRAM

	PLAZA ROOM 10 & 11	PLAZA ROOM 7 & 8
	Session 3.2 | Advances in Geosynthetics for Mining Chair | Mr Attila Marta *Proudly sponsored by* red earth engineering	**Session 4.2 | Advances in Geosynthetics for Sustainability, Durability and Innovation** Chair | Mr John Cowland
1.00pm	Marc Amtsberg, Atarfil Australia **Challenges in Establishing Longevity Criteria for White/Black Geomembranes in Critical Contaminant Storages**	Brett Marais, Desilting Solutions Pty Ltd **Spoil management in confined areas with GeoTubes – Case Studies**
1.20pm	Amir Shahkolahi, Global Synthetics **Performance of Geosynthetic Clay Liners in high risk applications**	Graham Fairhead, Fabtech Australia **Design Challenges of a Geomembrane Lined and Covered Hot Water Thermal Storage**
1.40pm	Edoardo Zannoni, Knight Piésold **Geosynthetics in mining applications in Africa**	Sam Allen, TRI Environmental, Inc. **The Efficiency of Using Air as a Permeant when Testing Hydraulic Properties of Geosynthetics**
2.00pm	David Johns, KCB **Construction of BGM-lined water supply dam in a very high rainfall and seismic region**	Boyd Ramsey, Boyd Ramsey Consulting LLC **White Polyethylene Geomembrane: It lasts longer**
2.20pm	Ryan Hackney, Geofabrics Australasia Pty Ltd **Laboratory Analysis of Durable Geocomposites for Exposure to Elevated Temperatures and Concentrated Brines**	Gus Martins, Huesker Australia **Subaqueous capping remediation with activated carbon geocomposite in Sydney/ Australia**
2.40pm–3.20pm	**Afternoon Refreshments** & opportunity to meet the sponsors and exhibitors	
	Poster Session & opportunity to view the posters and meet the authors	
	PLAZA ROOM 10 & 11	
3.20pm-4.20pm	**Keynote Panel | Prof David Williams & Prof Timothy Stark**	*Proud sponsor of Timothy Stark* red earth engineering
4.35pm	**Closing Ceremony** **Acknowledgement & Thanks** Siamak Paulson, President, ACIGS	

POSTER LISTING

#	AUTHOR	AFFILIATION	POSTER TITLE
1	Peter Atchison	*PageoConsulting Ltd*	**Gas resistant membranes, where civil engineering meets construction**
2	Jeroen Berends	*Geoinventions Consulting Services Pty Ltd*	**Case study of performance-based design geogrid reinforced mine rom wall**
5	Rajesh Bhavsar	*Geofabrics Australasia Pty Ltd*	**Cost optimised solutions for unsealed access roads using geosynthetics**
4	Eric Ewe	*Geofabrics Australasia*	**Reinforced soil embankment for shallow landslide protection**
5	Mohammad Adnan Farooq	*University of Technology Sydney*	**Application of tyre derived aggregates in railway tracks**
6	Ryan Hackney	*Geofabrics Australasia Pty Ltd*	**Bituminous geomembranes in australian conditions**
7	Colin Lim	*Naue Asia*	**Geogrids used as subgrade stabilisation – experiences from large- scale field trials**
8	Gus Martins	*Huesker Australia*	**Passive soil decontamination by landscaping with permeable geotextile contaminant barriers**
9	Gus Martins	*Huesker Australia*	**Geosynthetic concrete mattress for hydraulic applications**
10	Gus Martins	*Huesker Australia*	**Passive treatment of acid mine drainage (amd) with active geocomposites**
11	Boyd Ramsey	*Boyd Ramsey Consulting LLC*	**Sustainability in the geosynthetics industry: how are we doing – a progress report**
12	Mohit Saily	*Griffith University*	**Effect of geosynthetics on swell characteristics of expansive soil in large scale column tests**
13	Harini Senadheera	*Monash University/SPARC Hub*	**A novel graphene-based geotextile for use in pavement applications**
14	Amir Shahkolahi	*Global Synthetics*	**Behaviour of geosynthetics when used for subgrade and base stabilization based on large scale laboratory and fullscale field tests**
15	Amir Shahkolahi	*Global Synthetics*	**Engineered earth armoring solutions for erosion control and surficial stability: a sustainable alternative to hard armoring**
16	Jonathan Shamrock	*Tonkin & Taylor Ltd*	**Cuspated sheet geocomposite drain as an alternative landfill capping barrier layer**
17	Michael Sorensen	*Cirtex Industries*	**Design and construction of "true" load bearing mse bridge abutments, a case study**
18	Jong Hao Su	*Solmax Geosynthetics Sdn. Bhd.*	**A review on different types of geosynthetics drainage composites**
19	Andy Warwick	*Global Synthetics*	**The environmental benefits of high performance turf reinforcement mats**

THANK YOU TO OUR SPONSORS & EXHIBITORS

GOLD SPONSORS

FABTECH FLEXIBLE GEOMEMBRANE LINERS & COVERS PROTECTING THE ENVIRONMENT

GEOFABRICS Sustainable solutions

Global Synthetics LEADERS IN GEOSYNTHETICS

HUESKER Ideas. Engineers. Innovations.

SPONSORS

ADE CONSULTING GROUP

ATARFIL geomembranes

AXTER AUSTRALIA

GREENTEC CONSULTING

MACKENZIE ENVIRONMENTAL CIVIL AND ENVIRONMENTAL ENGINEERING

Naue

red earth engineering

Tensar

TRI AUSTRALASIA

EXHIBITORS

acigs Australasian Chapter of the International Geosynthetics Society

allflow Systems & Solutions

CIRTEX GAIN MORE GROUND

CONCRETE CANVAS Concrete on a Roll

AUSTRALIAN CONCRETE MATS www.ConcreteMats.com.au

SOLMAX

TENEO

Tiltex AUSTRALIA

SOCIAL PROGRAM

WELCOME EVENT

Tuesday 7 June 2022

Venue
South Beach, 30aa Stanley St Plaza, South Brisbane

Time
5.30pm – 7.30pm

Cost
Included for attendees who have a full registration

Proudly sponsored by

TRI AUSTRALASIA

CONFERENCE DINNER

Wednesday 8 June 2022

Venue
Level 12 South, Rydges South Bank Brisbane, 9 Glenelg Street, South Brisbane

Time
7.00pm – 10.00pm

Dress Code
Smart Casual

Proudly sponsored by

AXTER AUSTRALIA

red earth engineering

RedEarthEngineering.com.au

Brisbane | Perth

Geotechnical Engineering

Civil Engineering

Geosynthetic Engineering

Tailings & Water Dams

Peer Review / Subject Matter Experts

Construction Support & Quality Assurance

ORAL ABSTRACTS

ORAL ABSTRACTS

Wednesday 10.40am

Understanding Dipole Method Testing Results

Gilson A[1]

[1]Tri Environmental

Biography

Ms. Gilson spent the first part of her career as a containment facility design engineer and electrical leak location survey practitioner. She joined TRI in 2012 to focus solely on the implementation and advancement of electrical leak location technologies. She has over eighteen years and 17 million square meters of electrical leak location survey experience. Her contribution to the field of electrical leak location includes numerous published technical papers, educational seminars, presentations world-wide, and heading various ASTM Task Groups as for the recent revisions and additions to the ASTM Standard Guides and Practices.

Abstract

Dipole method testing is the most critical electrical leak location testing performed, since it can locate the most significant damage caused to installed geomembranes during cover material placement. This type of testing is particularly important for landfill cell construction, which includes the placement of a granular drainage/operations layer over the geosynthetic barrier system. Dipole method testing is highly subject to site conditions and testing effectiveness can range from 0% (no leaks detected, even large dozer damage) to 100% (all leaks detected, down to pinhole size or smaller). The long standing ASTM standard practice for dipole testing (ASTM D7007) has remained largely unchanged since its creation in 2003. Key reporting requirements are left out of this standard so that the client and report reviewer do not have sufficient information to determine the global effectiveness of the test and are largely only informed whether or not leaks were detected. Nearly two decades of dipole method testing experience has resulted in the creation of a new dipole method standard practice, ASTM D8265. The main feature of this standard is that it makes the testing results completely transparent to the client and/or reviewer. ASTM D8265 also standardizes method sensitivity across different dipole apparatuses and increases method effectiveness through the analysis of site response current. Due to the technical nature of the testing, some assistance may still be required to fully understand the testing results. This presentation will cover the differences between the two ASTM standards including technical requirements that affect method effectiveness and report output. A tutorial will also be provided on how to interpret testing results, including the analysis of site response current. Through example reporting from case studies, attendees will learn how to determine the level of effectiveness of a dipole method test through the reporting output required by the recently published ASTM D8265. The proper application of dipole method testing as confirmed by a rigorous review process is currently the most effective way to ensure landfill barrier layer integrity.

ORAL ABSTRACTS

Wednesday 10.40am

Field evidence on the effectiveness of the geogrid/geocomposite reinforcement in reducing induced stress on weak subgrades

Gallage C[1], Xue J[2], Zhong J[3], Ramanujam J[4], Lee J[5]

[1]Queensland University Of Technology (QUT), [2]UNSW Canberra at ADFA, [3]Logan City Council (LCC), [4]Department of Transport and Main Roads (DTMR), [5]WSP

Biography

Dr Chaminda Gallage is an associate professor in Geotechnical Engineering at Queensland University of Technology (QUT). He received MEng and PhD degrees in Geotechnical Engineering from the University of Tokyo, Japan. Within Geotechnical engineering research, he has focused on pavement technology, transport geotechnics, unsaturated soil mechanics, rainfall-induced slope instability, mining geotechnics and geotechnical instrumentation. In the last ten years, Assoc. Prof. Gallage has published over 120 refereed journal/conference papers, supervised 20 Higher Degree research students (PhD /MEng) to completion and received over $1.5M research funding from the Australian research council and industry research partners. Currently, he leads the "Use of smart geosynthetics for long-lasting and resilient pavements" project under ARC Industrial Transformation Research Hub (SPARC hub) (IH180100010).

Abstract

The population growth and the limited availability of suitable land for transport infrastructures challenge engineers to build pavements on weak subgrades. Geogrids/Geocomposites have been used to reinforce pavement layers to protect the weak subgrades by reducing imposed stresses and thereby making cost-effective, environmentally friendly, flood resilient and long-lasting pavements. However, more laboratory and field experiments are needed to understand the effectiveness of geogrids/geocomposites in projecting weak subgrades under local conditions with local materials. In this study, an instrumented pavement trial was constructed on a weak subgrade with several sections with different base layer thicknesses, Geocomposites/geogrids at various locations in the base layer, and reinforcements at the bottom of the thin surface asphalt layer. All sections have earth pressure cells at the top of the subgrade under wheel paths to measure the vehicle induced stress on the subgrade. In selected sections, a few earth pressure cells were placed on top of the base layer (just under the thin surface asphalt later). A year after the construction of the road trial, a water truck with know axel loads and tyre pressures was run the road trial by bringing the front tyre on top of the earth pressure cells and stopping there for about 5 min before moving to the next location. The measured pressure values by the earth pressure cells suggest that the induced stress in the subgrade can be significantly reduced by reinforcing layers close to the surface. The strengthening of the surface layers can reduce the required base/subbase granular layer thickness to be more economical or use the designed base/subbase thicknesses with reinforcement to make roads long-last.

ORAL ABSTRACTS

Wednesday 11.00am

Brittle Stress Cracking of HDPE Geomembrane Caused by Localised Over-Heating of Fusion Wedge Welds

Marta A[1]

[1]Red Earth Engineering

Biography

Attila has more than 25 years' experience in civil and geotechnical engineering, construction and materials testing in Australia and overseas. Attila is a Fellow of Engineers Australia a Chartered Professional Engineer and a Registered Professional Engineer, both Nationally and in Queensland (NER/RPEQ). He specialises in providing technical leadership in the detailed design, certification and construction oversight of major civil infrastructure projects to the Oil and Gas, civil infrastructure and mining sectors. Attila is also a subject matter expert (SME) in the field of geosynthetics. Attila is a Director of Red Earth Engineering Pty Ltd (REE). REE focuses on providing 'fit for purpose' detailed design and decommissioning/ closure solutions to clients in the mining, oil and gas, infrastructure and commercial sectors. REE has assisted many clients with earthworks certification, management of design and the design of specialised remediation works.

Abstract

This presentation discusses the results of an investigation carried out on a geomembrane lined dam in Australia which was temporarily decommissioned due to elevated leakage rates and observed development of geomembrane 'whales', after it was in service for only 4 years. The investigation identified a number of geomembrane cracks (or splits) in the vicinity of the whales. The cracks were orientated parallel to the outside edges of fusion wedge weld tracks where adjoining geomembrane panels were seamed. A 400 mm long crack was exhumed and analysed in the laboratory. The testing confirmed the heat affected zone adjacent to the crack was more susceptible to brittle stress cracking compared a control sample and exhibited raised crystallinity which is indicative of higher than industry standard welding temperatures and slower cooling. It is hypothesized that failure of the geomembrane occurred at the edges of fusion wedge weld tracks due to the combined effects of 1) raised crystallinity from unacceptably high welding temperatures; 2) geometric stress concentrating features along the weld profile, and 3) variations in ambient temperatures causing whales to 'breath', inducing a flexing action on the edge of welds. The geomembrane cracks were repaired in situ and the impact on leakage rates was assessed after the dam was recommissioned. The lessons learnt from the investigation are also presented.

ORAL ABSTRACTS

Wednesday 11.00am

Design and Construction Challenges for a 27m High ROM Retaining Wall

Garrard A[1,2], **Castillo R[1]**, Matthews G[2,3], Chaychuk D[2,3]

[1]CMW Geosciences, [2]ACIGS Member, [3]Geofabrics

Biography

Allan Garrard is a Senior Principal Civil/Geotechnical Engineer with CMW, who's engineering and geological experience spans over 35 years including the assessment, design, analysis and remediation of many slopes and walls in many countries.

Abstract

The geosynthetic soil reinforced Ravenswood Gold Mine (QLD) Run Of Mine (ROM) wall is the highest wall of it's type in Australia at 27m.

The paper describes the design and construction challenges faced and solved by the client, consultant, supplier and construction team, working collaboratively together.

The selected wall system comprised a Gabion type facing with integral woven mesh reinforcement tails in combination with durable high strength polyester geogrids with fibres encased in a LDPE sheath. The design tools adopted were utilised in such a way as to address the limitations of each method.

The selection of wall system type and arrangement was critical to the success of the project and the paper describes the versatility of the selected wall system with respect to overcoming specific challenges experienced on the project. This includes the use of backfill material which was readily available but not necessarily ideal for ROM wall construction.

Settlement and horizontal movement monitoring was conducted during construction, and this provides a rare comparison with the movements predicted at the design stage.

In addition to the main design issues, the paper addresses key construction attributes, including tolerances, construction speed and the importance of engaging an experienced construction team.

No project which pushes the boundaries is completed without the need to have addressed and solved ongoing issues in a timely manner and the paper discusses the importance of engaging the full team during the construction and commissioning stages of the project.

Wednesday 11.20am

Global ageing behaviour of a polypropylene random copolymer geomembrane with phenolic antioxidants

Peham L[1], Wallner G[1], Nitsche D[2]

[1]Institute of Polymeric Materials and Testing – Christian Doppler Laboratory – University Linz, [2]Agru Kunststofftechnik Gesellschaft m.b.H.

Biography

Graduation from the technical high school for mechanical engineering (2014)

Bachelor Degree in Polymer Science (2019)

Master Degree in Polymer Technologies and Science (2020)

PhD position as a researcher at the Institute of Polymeric Materials and Testing at the University Linz, Austria(since 2020)

Abstract

This paper deals with the global ageing behaviour of a polypropylene random copolymer geomembrane for giga-scale pit thermal energy storages. Accelerated ageing methods based on, the reduction of specimen thickness and the increase of exposure temperature, were implemented and used to assess the long-term performance and the lifetime. The hot air exposure temperature was ranging from 65 to 135°C. As ageing indicator, primarily the phenol index was used. Degradation of the phenolic groups of antixidants was monitored up to 25,000 hours of hot air exposure. At about 110°C a transition in degradation kinetics was discernible which was attributed to changes in inner mobility.

Keywords: polypropylene, liner, ageing behaviour, thermal energy storage, lifetime assessment

1. Introduction

Polymeric geomembranes are state of the art for seasonal thermal energy storages. Currently, polyethylene liners are used which allow for maximum service temperature up to 80°C. However, the requirements for polymeric liner materials are getting more demanding due to continuous increase of the operating temperature and the temperature load profile of such giga-scale thermal energy storages.

ORAL ABSTRACTS

Hence, the main objective of this paper was to develop and investigate the global ageing behaviour of a high-temperature resistant polypropylene liner grade using micro-sized specimen and novel characterization methods.

2. Experimental

Liners with a thickness of 2 mm were manufactured on an Extruder EN45 25D by AGRU Kunststofftechnik (Bad Hall, Austria). A stabilizer system based on the phenolic antioxidants Irganox 1010 and Irganox 1330 with a concentration of 0.55 w% and a ratio of 2:5 was added to the investigated polypropylene random copolymer (PP-R) grade. For accelerated ageing, micro-sized specimen with a thickness of 100 µm were prepared. The slices were taken by CNC-milling using a home-build cutting tool on an EMCO E600 (Hallein, Austria). Due to the fact, that hot air is more critical for PP-R than hot water environment, accelerated ageing was carried out in hot air at temperatures ranging from 65 to 135°C with intervals of 10°C. After defined intervals, specimens were removed and characterized by IR spectroscopy in transmission mode. The integral of the phenol absorption peak at 3,646 cm-1 was calculated and normalized by the neighbouring absoption peak at 3,765 cm-1, attributed to the co-catalyst Al2O3. Full degradation was classified when phenol index dropped below a value of 1.0.

3. Results

Diffusion and evaporation lead to a first distinct drop in phenol index. This effect was ascertained in the early ageing stage, especially at lower exposure temperatures up to 95°C. After this initial drop, the phenol index revealed a linear decrease over hot air ageing time. This decrease was attributed to thermooxidation of the phenolic groups and conversion to carbonyls. The activation energy for phenolic antioxidants and polymer degradation was different for temperatures below and above 110°C. These differences were attributed to changes in inner mobility (Tα) and the compatibility of phenolic antioxidants and polypropylene matrix.

4. Acknowledgments

This research work was started in the giga_TES project and continued in the Christian Doppler Laboratory for "Superimposed Mechanical-Environmental Ageing of Polymeric Hybrid Laminates".

Wednesday 11.20am

A Performance-Based Design for Large Reinforced Soil Structures and Risk Control Process During Construction

Berends J[1], Kok B[1], Davie G[2], Roff S[2]

[1]Geoinventions Consulting Services Pty Ltd, [2]Georgiou Group

Biography

Jeroen Berends is a Fellow Chartered Geotechnical Engineer with 22 years of experience in design and construction. He has provided optimized geotechnical designs on many large-scale projects encompassing the fields of civil infrastructure and mining in Australia and Africa. His interest and areas of expertise range from slope stability design, retaining structures, reinforced soil structures, and slope stabilisation. He is also an accredited slope assessor which allows him to undertake risk assessments for the Department of Transport and Main Roads (DTMR) and Roads and Maritime Services (RMS). During his spare time, Jeroen assists many Universities with research studies where design methods may be improved based on using practical field monitoring data and experience. Due to his extensive knowledge in geosynthetics, he has assisted DTMR with compiling two specifications for geosynthetics in road pavements.

Barry has been working as a geotechnical engineer for more than 24 years. During this time, he has been responsible for the geotechnical aspects of several major transport infrastructure projects both in Australia and internationally. Barry is highly skilled in design review and identifying ways to optimize initial design concepts during tender and construction stages. He is also provided innovative and "fit-for-purpose" temporary works design solutions to several major projects. During his busy working schedule, Barry also spent time mentoring young engineers and published case studies related technical papers to share his experience with wider industry practitioners. His recent publications focused on the reliability-based geotechnical design (RBGD), back-analysis of the secondary consolidation post-construction settlements, instrumented piled foundations, ground improvement solutions, and complex hybrid retaining structures/systems.

ORAL ABSTRACTS

Abstract

During the construction of the 325m long balanced cantilever bridge as part of the upgrade for the New England Highway at Bolivia Hill, a temporary access track of approx. 1,050m was required for the construction of the bridge piers. The design and construction of the temporary access track were challenging due to the highly variable rock formations, undulating topography, and restricted footprint of the catchment area. This necessitated the need for a large geogrid reinforced soil structure up to 7.8m high with multiple drainage crossings required for the catchment flow paths. Due to the significant loading applied to the geosynthetic reinforced soil structure during construction over its service life, foundation improvement was required together with the introduction of high-strength geogrid. Site-won materials were engineered with the blending of limited import select fill to complete this highly challenging structure. This paper describes the engineering approach of the performance-based design methodology to assess the stability and deflection of the structure. Finite element and limit equilibrium analyses were performed to verify design sections and validated with a field instrumented monitoring scheme adopted by the contractor to ensure the safety of the structures throughout the design life. A safety-in-design and emergency response plan were both evaluated during the process.

Wednesday 11.40am

Encapsulation of Insitu Contamination using an Innovative Geosynthetics Solution

Brock C[1]

[1]ADE consulting group

Biography

Craig is a Chartered Geologist and a Registered Engineer of Queensland with over 15 years' experience in the geotechnical industry. He has completed projects in New Zealand, Australia, PNG, England, Northern Ireland, Kazakhstan and Malaysia.

Craig's field engineering and construction supervision experience includes dam construction, large scale cut and fill operations, civil infrastructure, shallow and deep foundations, and slope stability assessments.

He has experience in most aspects of geotechnical investigations with particular emphasis in the areas of site investigation design, drilling/logging, geotechnical instrumentation, site supervision, and geological and geomorphological mapping.

Craig has been the project manager for a number of tailings design and monitoring scopes in Queensland and PNG.

Craig Brock, CGeol, RPEQ
Senior Geotechnical Engineer, ADE Consulting Group

Abstract

A Remedial Action Plan (RAP) that was prepared for a historically contaminated (Arsenic) site recommended a remediation strategy comprising targeted excavation and in-situ encapsulation of the contaminated soils. The remediation strategy was then developed into a detailed design package. The intent of the remediation design was to manage the historical contamination so that it no longer posed an unacceptable risk of harm to human health and/or the environment. Previous attempts at remediation on the site were not considered adequate; and the client aimed to mitigate the potential direct exposure scenarios, reduce the ongoing contribution of contaminates to shallow and perched groundwater and the nearby surface water environments.

ORAL ABSTRACTS

A desktop review of the available historical information and a geotechnical site investigation was undertaken to aid in proposing the most suitable remediation strategy for the site. The design approach adopted consisted of targeted excavations of the most contaminated soils and placement of this excavated material within the former operational area of the site prior to encapsulation using a geosynthetic capping system.

The capping design comprised full encapsulation of the excavated and in-situ soils with a Geosynthetic Clay Liner (GCL) and an upstream hydraulic barrier to exclude groundwater from the capped area. The capped area was designed to form a sustainable natural landform that followed the existing contours and reported to the existing site drainage features. The design included an upgrade of the existing site drainage features including the use of rip rap for erosion protection and geosynthetic cementitious composite mat (GCCM) in the old drainage channels. A detailed specification and construction quality assurance plan (CQA plan) were prepared as part of the design package to assist in achieving the desired remediation objectives.

Wednesday 11.40am

The bearing capacity of a granular layer on weaker sand and the benefits of mechanical stabilisation

Ali A[1], Lees A[2], **Buckley J**[3]

[1]Geofabrics Australasia, [2]Tensar International, [3]Tensar International

Biography

Dr Abid Ali works as an Application Engineer for Geofabrics Australasia. He has a special interest in numerical modelling and the application of geosynthetics for roads and working platforms.

John is directly responsible for all of Tensar's business activities in the Australia and New Zealand region. John has previously worked with the design and construction of geosynthetic applications such as reinforced soil structures, permanent and temporary roads, and waste containment facilities. More recently, he has been involved in business development and, research and development for waste management solutions and piling / foundation systems.

Keywords

Working platform; Foundations; Design methods & aids; Temporary works; FEA; and FELA.

Abstract

The implementation of a stronger granular layer as a working platform over a relatively weaker granular layer involves determining the bearing capacity of a two-layer system for rectangular loads. The existing design methods suffer from several drawbacks, such as over-simplification, applicability to only strip or circular footings, and being validated by a small number of small-scale 1-g model tests. As a result, these methods are difficult to use or implement into a design software. In this presentation, a new and highly practical design method is proposed wherein the bearing capacity of the two-layer system is a function of the shear strength and effective unit weights of the individual layers. The method, an extension of the T-value method for cohesive subgrade, is derived from FEA parametric studies and has been validated against published physical model tests, Finite Element Limit Analysis (FELA) and existing design methods. The new method can be applied to all rectangular shape ratios with

ORAL ABSTRACTS

dry and saturated layers. Furthermore, it also allows for the realistic incorporation of the benefit of multi-axial stabilising geogrid in terms of enhanced shear strength in the upper granular layer, leading to thinner working platforms and therefore cost savings, without compromising safety.

Wednesday 12.00pm

Geotextile Protection Efficiency – The relationship between confining pressure and geotextile mass

Hornsey W[1]

[1]TRI Australasia

Biography

Warren is professional civil engineer, with experience in Africa, UK and Australia. He is the Director of TRI Australasia, an independent geosynthetic testing and analysis laboratory, based on the Gold Coast in Queensland. He is directly responsible for all geosynthetic testing and support in the Australasian region.

He has 24 years experience in geosyntheic design, construction and R&D, he is the past Chairman of Standards Australia CE20 committee on geosynthetics and a past committee member of the International Geosynthetics Society. He has published over 20 peer reviewed papers covering a range of geosynthetic applications and has a passion for all things geosynthetic related.

Abstract

The use of nonwoven geotextile protection layers in the base of a landfill cell, between the HDPE geomembrane and the drainage gravel, is common practice throughout the world. The purpose of this geotextile is to reduce the strains developed in the HDPE liner, the maximum allowable strain varies from country to country but typically ranges from 3 to 6%. Several factors influence the strains developed in the geomembrane such as confining pressure, gravel size and grading, type and mass of geotextile, geomembrane thickness and whether a subgrade is incorporated in the test setup.

The difficulty for designers is the selection of a suitable geotextile given the variables described above, this work investigates the relationship between geotextile mass and confining pressure for a given gravel profile. The paper analyses over 20 different mass/pressure combinations which provide engineers with guidance on the grade of geotextile to specify when using similar gravel.

ORAL ABSTRACTS

Wednesday 12.00pm

Innovative Moisture-Managing Reinforcement Geosynthetic for Mechanical and Hydraulic Stabilization

Yee T[1], **Ball P[2]**, Tong T[1]

[1]TenCate Geosynthetics Asia, [2]TenCate Geosynthetics Asia (ANZ Office)

Biography

Phil Ball is currently Country Manager, Australia & New Zealand for TenCate Geosynthetics, based in Brisbane. Phil has over 28 years' experience in the geosynthetics industry, having held roles with both Maccaferri and Geofabrics Australasia prior to working for TenCate. These roles have seen him work and travel extensively throughout New Zealand, Indonesia, Malaysia and Australia.

Tack Weng *graduated in Civil Engineering from University of Malaya in 1982. He has 40 years experience in geotechnical and geosynthetics engineering which includes 25 years with TenCate Geosynthetics where he is currently Technical Manager for Asia. Has over 50 publications. His Geosynthetics International paper "Modelling the geotextile tube dewatering process" was voted top 3 papers of 2012. Delivered a Theme Lecture at the 5th ARC on Geosynthetics, Bangkok in 2012; a Keynote Lecture at Nanyang Technological University, Singapore in 2016; and a Keynote Lecture at the 6th ARC on Geosynthetics, New Delhi in 2016.*

Abstract

Geosynthetics with high tensile modulus have been used for mechanical stabilization of roads and railways for decades. They improve the performance of roads and railways on difficult soil subgrades by imparting tensile restraint to the boundary materials e.g. base and sub-base aggregates, ballast and sub-ballast aggregates, subgrade soil; and often resulting in cost saving design options. Recent development of a geosynthetic reinforcement with integrated moisture management properties in North America have further extended the application frontier of geosynthetics in roads and railways on difficult soil subgrades. The innovative geosynthetics incorporate special function yarns with the ability to move capillary water in soil and aggregate layers, and is capable of improving on the moisture condition, and therefore the engineering performance of the boundary materials.

A moisture-managing reinforcement geosynthetic stiffens aggregate layers by imparting tensile restraint, resulting in what is commonly termed as mechanical stabilization of aggregate layers. A moisture-managing reinforcement geosynthetic can also improve aggregate layers by causing the lowering of the equilibrium moisture content and therefore the long term performing resilient modulus, resulting in what is termed as hydraulic stabilization of aggregate layers. Furthermore, a moisture-managing reinforcement geosynthetic can moderate the moisture content in subgrade soils to prevent subgrade weakening under increased moisture content, as well as to reduce differential subgrade heaves.

This paper will discuss the various applications of the moisture-managing reinforcement geosynthetic with laboratory testing and case study illustrations. As an example, the moisture-managing reinforcement geosynthetic was used in a 20km section of Dalton Highway in Alaska that was prone to frost heave and thaw weakening of subgrade. The moisture-managing reinforcement geosynthetic solution resulted in an estimated savings of USD2.5 million over the conforming conventional solution. Construction of the highway section began in August 2012 and was paved over during the summer months of 2013. The 20km section of pavement constructed with the moisture-managing reinforcement geosynthetic have performed to the satisfaction of the client to date.

ORAL ABSTRACTS

Wednesday 1.20pm

Sorption of Per- and Poly-Fluoroalkyl Substances onto the Geotextile Components of the Geosynthetic Clay Liner

Mikhael E[1], Bouazza A[1], Gates W[2]

[1]Department of Civil Engineering, Monash University, [2]Institute for Frontier Materials, Deakin University

Biography

Elissar is an environmental engineer, currently undertaking a PhD in Civil Engineering at Monash university in Victoria, investigating the fate and migration of PFASs through Geosynthetic Clay Liners. Elissar also has worked on various environmental and civil projects throughout Victoria.

Abstract

Per- and polyfluorinated alkyl substances (PFASs) encompass a diverse group of widely used surfactant chemicals that present a potential risk to human health and the environment. PFASs are present in various consumer and industrial products sent to landfills at the end of their useful lives. Modern landfills typically utilise engineered geosynthetic composite liner systems to encapsulate solid waste, contain landfill leachate and prevent the escape of contaminants. Geosynthetic clay liners (GCLs) are used in geosynthetic composite liner systems to preclude or slow the flow of fluid and contaminants into the surrounding soil and underlying groundwaters. Sorption of micropollutants, such as PFASs, to GCL constituents, is a significant partitioning retention process that may substantially impact contaminant migration and attenuation through geosynthetic composite liner systems. However, knowledge of contaminant transfers in GCL materials is limited to metal substances, volatile organic compounds, aromatic hydrocarbons and phenolic compounds. Sorption of anionic PFASs onto various media predominantly occurs through hydrophobic and electrostatic interactions. The absence of sufficient hydrophobic organic matter and the net negative structural charge of the bentonite component of the GCL indicates that there is limited potential for PFAS sorption on the GCL, but this has yet to be satisfactorily proven. Furthermore, there is no information available in the current literature on the sorption of PFAS compounds into the geotextile components of the GCL. This paper explores this latter and fills the existing knowledge gap by presenting the first results on the sorption of PFAS compounds into the geotextile carrier and cover components of the GCL.

ORAL ABSTRACTS

Wednesday 1.20pm

Evaluating the benefits of geogrid in pavement and foundation applications with onsite testing

Sorensen M[1]

[1]Cirtex Industries Pty Ltd

Biography

Michael the Technical Manager at Cirtex Civil for Australia & New Zealand and has 15 years' experience in the design and practical application of geosynthetics. Michael is a Chartered Member of Engineering New Zealand and has a special passion for ongoing learning in this fast-moving field of engineering and sharing knowledge with other professionals.

Abstract

A key to to ensuring the continued and sustained growth of geosynthetics in infrastructure projects is to be able to demonstrate clearly, concisely and cost effectively the actual attainable benefits to the client. The unquestionable benefits in cost, time and environmental sustainability are well known, however they are often presented in vague terms and can take on the aura of black magic or an art form. General rule of thumb savings are not sufficient to satisfy detailed design requirements. Some areas of the industry such as MSE walls have much more specific and quantifiable data than other areas such as foundation stabilisation.

This presentation demonstrates that the benefits of geosynthetics in a foundation are in fact a direct result of accepted engineering principles and are measurable and definable in a timely and cost-effective way. We will present a project related example and a product related example where such testing has provided accurate timely results.

A key to this is being clear on the engineering functions we can achieve with a geosynthetic in a pavement or foundation application, and the problems we are solving with that benefit, so we can target our testing to get real measurable data. With so many variables incorporated into full scale tests such as variations in subgrade strength and moisture condition, aggregate type, particle size distribution and hardness, and construction controls the results can often get buried in detail and lost in interpretation.

In this application of pavement and foundation stabilisation the end benefits we are targeting include rut reduction through traffic benefit ratio, base course reduction, bearing capacity increase, and mitigation of liquefaction & differential settlement.

Typically, we see rut reduction, TBR and BCR data generated through full scale field or laboratory traffic trials giving usable and realistic data to design with, however the increased stiffness of a composite geogrid reinforced layer is subject to so many site specific factors that very little data generated in a laboratory can be realistically applied to a site.

With the advances in the technology and testing equipment available, on-site testing of a geosynthetic solution for increased stiffness is now more viable than ever before, using the Light Weight Falling Deflectometer and the Plate Load Test.

We will present a case study of a large distribution warehouse which utilised project specific PLT to demonstrate the viability of a geogrid raft system with available site materials, then we will present the results of foundation stiffness trials demonstrating the stiffening performance of multi layered geogrid reinforced shallow foundations using commonly available aggregates and geogrids to provide quantifiable comparison data.

ORAL ABSTRACTS

Wednesday 1.40pm

Overview of the advances in Geocomposites for the containment of PFAS impacted materials

Moodie D[1], Askeland M[1], Coggan T[1], Chaturvedi D[1]

[1]Ade Consulting Group

Biography

Damien Moodie is an environmental scientist currently working for ADE consulting group. Damien completed his PhD on the environmental impacts of PFAS contaminated biosolids with RMIT University in October 2021.

Abstract

PFAS has grabbed attention globally with its widespread impacts related to the use of AFFF, notably due to its mobility and longevity within hydrological systems. However, impacts associated with PFAS in leachates derived from encapsulated soils or associated with landfills, while known, are far less often discussed. Within the industry it is well known that PFAS, due to their mobility and relatively low concentration at which it PFAS is considered a risk, pose a significant management challenge.

The short term and long term storage and disposal of per- and polyfluoroalkyl substances (PFAS) impacted solid matrices, whether it be for stockpiled materials (soils, concrete, asphalt, biosolids) awaiting remediation or disposal or municipal landfills (including putrescible waste), pose a potential risk to their surrounding environments through the leaching of adsorbed PFAS, following saturation of the matrix, and subsequent transportation of the PFAS impacted mobile phase PFAS to surface water or groundwater.

This presentation explores historical methods for PFAS management in waste containment facilities and juxtaposes them against new novel methods for the management of PFAS in leachates using a range of barriers and geocomposites. These include geocomposites impregnated or containing a wide variety of specialised sorbents and the discussion of how these can be applied alongside other PFAS management mechanisms to mitigate the risk posed by PFAS.

ADE recently had the opportunity to stress test a commercial in confidence Geosynthetic product at our Altona Laboratory. One interesting observation from the initial results, indicated that PFAS removal performance may vary while the membrane undergoes wetting, reaching its optimal removal performance only after the membrane had become fully saturated. This may be something that needs to be considered depending on the products proposed application.

PFAS behavior in leachate systems is incredibly complex and determined by the chemistry of the solid, the leachate solution and the PFAs congeners themselves. Included in this complicated mixture the impacts of contact time (flow rate), concentration, and competition. Considering this, the correct Geotextile tool needs to be selected for managing PFAS impacted leachates on a case-by-case basis, with some tools being unsuitable for the specific chemistries encountered under certain waste management circumstances.

The presentation discusses these complex behaviors and how these impact on the selection of certain PFAS risk mitigation options, including providing some detail into the testing conducted to determine these, as required to demonstrate the suitability of these novel geocomposites and what could be a tangible direction for Advanced geotextile for PFAs management in the future.

ORAL ABSTRACTS

Wednesday 1.40pm

Flexible Reinforced Soil Wall

Kianfar K[1]

[1]PhD, MSc, BSc, FIEAust, CPEng, NER

Biography

Kourosh is a Chartered Professional Engineer (CPEng) and has 28 years extensive experience in the area of Geotechnical and Civil Engineering in Australia and overseas.

He has extensive analytical, numerical, and experimental experience in geotechnical engineering. Kourosh has experience in the areas of project management, ground improvement, slope stability and excavation modelling and assessment, interpretation of subsurface conditions, site investigation management, numerical modelling, assessment of soil and rock parameters for foundation design, and soft soil improvement design. Kourosh has worked as a member of design team and/or project manager on many projects since 2008, including Pacific Highway Upgrade, Albion Park Rail Bypass, Berry to Bomaderry Upgrade, Shell Cove Boat Harbour, Haywards Bay Development, and Manildra's Packing Plant.

He completed his PhD degree in geotechnical engineering in soft soil improvement via vertical drains and vacuum preloading through University of Wollongong (Australia) in 2012, and worked as a University Lecturer for about 13 years overseas, as well as tutoring different geotechnical subjects in University of Wollongong between 2007 and 2012. Kourosh is also currently an Honorary Research Academic at University of Wollongong (UOW) and University of Technology Sydney (UTS).

Kourosh Kianfar, Executive Technical Principal at ADE Consulting Group, PhD, MSc, BSc, FIEAust, CPEng, NER

Abstract

A flexible Reinforced Soil Wall (RSW) was designed and constructed as part of the Shell Cove Boat Harbour Development project. The Shell Cove Boat Harbour development is the largest coastal residential development ever initiated by a local government authority in Australia. When complete, the boat harbour will provide a water surface of approximately 12 hectares which is approximately 30% larger than Darling Harbour.

Soft soils are present within and surrounding the footprint of significant portions of the harbour. A surcharging strategy was developed and adopted for improvement of the soft soils surrounding the harbour. The original surcharge design for the northern portion of the site included a surcharge mound and a batter (about 150m long and 18m wide, with a footprint of about 2700 m2). Part of the batter was only required temporarily during construction and soft soil improvement, and part of that was a permanent section. The main requirement of the batter was to support the required temporary (about 8m high) and permanent (about 3m high) embankment fill.

To eliminate the batter, a flexible Reinforced Soil Wall (RSW) was designed and constructed which comprised of the following three retaining walls over each other, which based on the existing information has been done for the first time with this arrangement:

- A Gabion wall at the based (part of permanent section of the wall)
- A reinforced wall with flexible facing over the Gabion wall (as the second permanent section of the wall)
- A Wrap-Around wall over the main reinforced wall (as the temporary section of the wall)
- The height of the RSW varied between 2.5m and 5m, and its width varied between 6m and 9m. The combination of the three retaining walls was mainly to eliminate the requirement for acquiring about 2700 m2 land, however the solution had the following advantages too:
- Gabion wall:
    - Providing a sustainable and reliable foundation for the sections above it
    - Providing drainage at the toe and underneath of the wall
    - Connecting the drainage to the underneath drainage layer
- Main reinforced wall:
    - Providing a flexible permanent retaining wall over consolidating/creeping soft soils
    - Providing a permanent green face aesthetically matching with the environment
    - Eliminating the requirement to install any wall facing
    - Tolerating differential settlements
    - Adjustable at the top following completion of soft soil improvement and removal of the temporary section
- Wrap-Around Wall:
    - A low-cost surcharge structure
    - Easy for construction and removal following completion of soft soil improvement

ORAL ABSTRACTS

Wednesday 2.00pm

New developments in prevention and protection of water resources. Why PVC-EIA alloys are the best choice for long-term, improved performance

Lens J[1], Peebles R[1], Reed L[1], Lewis B[2]

[1]Cooley Group, [2]Geofabrics

Biography

Dr. Jan-Pleun Lens is Executive Vice President, Research and New Business Development at the Cooley group, a global manufacturer of coated fabrics. He has over two decades of expertise in research and development in polymer technology, intellectual property, product management, and product stewardship. He has published over 25 scientific articles and is (co-)inventor on more than 60 patent families. Prior to the Cooley Group, Dr. Lens held different technology leadership positions at GE Plastics (now SABIC) and was VP, Research and Application Development at FRX Polymers, a startup company that developed and commercialized the first polymeric, non-halogenated flame retardants. Dr. Lens has a MSc in Chemical Engineering and a PhD in Polymer Technology from the University of Twente in the Netherlands.

Abstract

Geomembranes have a long history in water and mining sectors in Australia. Chlorosulfonated polyethylene (CSPE) has a proven performance and has been a go-to material for water reservoir liners and covers for decades. However, ongoing emphasis on sustainable industrial production processes, supply chain constraints, cost effectiveness, and a desire to use materials with application-specific service/design life that are easier to install have led to the search for alternative materials.

PVC compounds are excellent materials to produce coated fabrics for liner and covers. Traditionally, PVC compounds contain liquid plasticizers to provide flexibility, but these low molecular weight additives are prone to migration and release in the environment. The development of high molecular weight, solid, plasticizers, such as ketone ethylene esters (KEE), led to PVC ethylene interpolymer alloys (PVC-EIAs) where plasticizers are locked in and cannot be removed from the polymer matrix. PVC-EIAs have been introduced to the Australian market and there is growing demand due to their beneficial qualities, particularly in comparison to CSPE. Ongoing product innovations have further improved the PVC-EIAs, increasing its longevity and weathering resistance, heat resistance, chemical resistance, and ability to contain certain chemicals.

The current paper highlights developments of new PVC-EIA compounds for use in liners and covers for potable water reservoirs. Physical data underline the suitability of the products for the applications. Extensive weathering and actual outdoor exposure show that these new products have a unique long-term integrity of more than 30 years. Improving chemical resistance was another key aspect in the development of these new products. This is of particular interest where harsh chemicals, such as chlorine or chloramine, are used as disinfectants in potable water storage. These chemicals not only can affect the integrity of polymers but also lead to break down of additives that are used in the compounds to provide the required long-term heat and UV-stability. Immersion of different materials in chlorine and chloramine, followed by Congo red thermal stability analysis showed that the new materials are best in class among different PVC-EIA products. Although this approach does not allow the comparison with CSPE, experiments where materials were exposed to gaseous chlorine and chloramine showed that the PVC-EIA materials outperformed CSPE after just 60 days. Also, in the chemical resistance analysis against hydrocarbons (e.g. coming from top-down contamination in mining sites), PVC- EIA materials outperform the CSPE materials.

Finally, the PVC- EIA materials have been assessed for the containment of PFAS. Although it has been shown in the past that PVC- EIA materials show robust chemical resistance against different PFAS, this does not reveal anything about their suitability to contain these forever chemicals in landfills or clean-up sites. Diffusivity testing with different PFAS molecules and PVC-EIA materials show that the new PVC- EIA materials highlighted in this paper show excellent barrier properties against PFAS.

Innovation and material development has yielded new products that remove limitations of the use of current materials. PVC- EIA materials will be the smartest choice for future liners and covers in a wide-array of different containment applications.

ORAL ABSTRACTS

Wednesday 2.00pm

Ultimate resistance of geogrid-reinforced working platforms for tracked plant over cohesive subgrade

Khansari A[1], Klompmaker J[2], **Colin Lim[2]**
Shahkolahi A[3]

[1]BBG Bauberatung Geokunststoffe GmbH & Co. KG, [2]NAUE GmbH & Co. KG, [3]Global Synthetics Pty Ltd

Biography

Colin Lim is a registered Professional Engineer (P.E.) with the ASEAN Chartered Professional Engineer Coordinating Committee (ACPECC). He obtained his Bachelor of Engineering (Civil) from Universiti Tenaga Nasional (UNITEN) Malaysia in 2012 and subsequently obtained his Master's Degree in Geotechnical Engineering at the School of Graduate Studies, Universiti Teknologi Malaysia (UTM) in 2014.

He started his career with G&P Geotechnics, a Malaysian consulting firm specializing in Geotechnical Engineering in 2012 before leaving the company in 2019. Throughout his 7 years of consulting career, he has been involved in geotechnical engineering work such as deep and shallow foundation, retaining wall, basement excavation, slope strengthening, ground treatment and coastal reclamation. In Oct 2019, he joined NAUE Asia, a German geosynthetics manufacturer as the Business Development Manager where he is responsible for delivering technical solution and market development of geosynthetic products in Asia, particularly in the infrastructure segment. He has published 2 technical papers on geotechnical engineering in international conferences and he is a member of institutions such as The Institution of Engineers Malaysia (IEM), Malaysian Geotechnical Society (MGS) & International Geosynthetic Society – Australasian Chapter (ACIGS). He has been actively involved in Malaysian Geotechnical Society (MGS) since 2018 where now he is serving as the vice chairman for the Youth Wing of MGS.

Abstract

Field investigations and accidents on construction sites have revealed that mainly two mechanisms govern the stability of geosynthetic-reinforced working platforms and hardstands exposed to high concentrated loads by piling rigs or cranes: (i) punching shear failure of the reinforced platform subjected to the high localised forces; (ii) rotational/overall failure of the working platform founded on the soft cohesive soil.

In this paper, a particular focus is paid to identify the most influencing parameters affecting both rotational and punching shear failure of working platforms. For the punching shear failure, the Meyerhof's method is modified to account for the footing punching through a geosynthetic reinforced granular platform material overlying a soft cohesive subgrade. For the rotational and overall failure, the Kinematic Element Method (KEM) has been applied which implements the rigid body approach to examine the equilibrium state, thus enabling a full interaction of soil wedges with the intersecting geosynthetic reinforcement. The set-up models are applied to perform a systematic parametric study by variation of the most influencing parameters affecting the ultimate limit state (e.g. soil shear strength, loads, geometry of tracks and etc.). Accordingly, a new simplified model has been developed to predict the ultimate bearing capacity of working platforms corresponding to both punching and rotational failure modes. A simplified non-dimensional equation has been developed which describes the threshold between the rotational and punching failure modes beyond which the rotational stability of the reinforced working platform may govern the design procedure.

ORAL ABSTRACTS

Wednesday 2.20pm

Advances in Bituminous Geomembrane Welding Methodology

Kendall P[1]

[1]Axter Australia

Biography

With a background in Civil Engineering from Georgia Institute of Technology and Physics from The University of the South I have been active in the Geosynthetics industry for the last 10 years holding technical positions with major manufacturers. In these roles I have provided technical support to design engineers, developed new testing and installation methods for various materials and developed software tools to support the appropriate use of geosynthetics. I am a licenced Professional Engineer in the state of Texas and a Registered Professional Engineer Queensland (RPEQ).

Abstract

The use of bituminous geomembranes (BGMs) is expanding rapidly into new containment applications due to developments in welding methods and welding equipment. Commercially available bitumen welding technology which has proven effective in roofing and other waterproofing applications has been adapted for use on large scale civil and mining applications. This paper reviews the welding technology currently available to bituminous geomembrane installers for large scale environmental containment installations. The novel introduction of hot air welding equipment has expanded the application area of BGMs significantly. By forgoing the need for an open flame, hot air welders provide safety in the presence of flammable gas conditions, a circumstance often present on waste capping installations. In addition to safety benefits, the hot air welder produces a consistent application of direct heat which can have benefits for construction quality assurance and also has the potential to reduce total welding time and labour costs. Examples of the use of hot air welders in harsh Australian conditions are presented and the practical lessons gained from this experience is shared. Finally, a conceptual thermodynamic model for BGM welding is developed using the conservation of energy principle. It is desirable to optimize the efficiency of the welding process by maximizing the strength of the weld while minimizing the time and energy expended to create the weld. By understanding the thermodynamic properties of the materials used and the energy inputs of the welding equipment, a thermodynamic model can be useful to optimize the equipment and BGM properties to match the conditions on site. Variables such as initial geomembrane temperature, welder power, weld width and weld speed are all relevant to the response of the BGM material. The model is useful to test the sensitivity of each of these variables to optimize the weld strength and installation efficiency. Variations in the model inputs are compared with welding performance on site. It was observed that initial liner temperature can vary by over 50 C during installation due to ambient temperature and the intensity of the sun. The model predicted that such nontrivial temperature variations of the BGM necessitates welder settings which apply more heat for lower BGM initial temperatures. This effect was confirmed by performance observations.

ORAL ABSTRACTS

Wednesday 2.20pm

Use of site-won soil for reinforced soil slopes and walls

Lelli M[1]

[1]Maccaferri Malaysia

Biography

Matteo Lelli is a chartered civil engineer registered in Italy since 2012. He has been actively involved in the design and construction stages of several private and public infrastructures in Southeast Asia. He is author and co-author of several technical papers published in the proceeding of international geotechnical and geosynthetic materials conferences. He joined Maccaferri in 2013 in their Italian HQs, and he has served for 5 years as Technical Manager of Maccaferri Indonesia branch. With Maccaferri, he mainly provides system solution in areas of retaining structures, rockfall protection, slope erosion control, and riverbank protection. Besides design analysis and site support to contractors, he had also actively involved in various technical presentations to public sector and education institution.

Abstract

Granular backfills are a finite resource that is coming under increased pressure. Considerable economic and environmental savings can be achieved by using low quality excavated soil waste generated on construction sites as structural backfill.

Experimental investigations have shown that if a combined drainage / reinforcement geocomposite is incorporated into the design that the engineering characteristics of the backfill, and in particular the soil/reinforcement interaction, will be greatly enhanced. A 20-50% increase in the geosynthetic-soil interaction for a geocomposite over a conventional geogrid was observed. A design approach is highlighted which allows steep reinforced slopes to be designed with excavated soil waste and a geocomposite. The design approach showed that a geocomposite could significantly increase the stability of the slope by dissipating excess pore pressures in a 24 hr period. Two case histories highlight where a geocomposite was successfully used to construct slopes using cohesive excavated soil waste.

Wednesday 2.40pm

Design of liner system for bauxite residue storage system in desert environment

Webb D[1], Gassner F

[1]Golder WSP

Biography

Darren is a civil engineer with 19 years industry experience. This includes extensive experience related to design and construction with geosynthetics. Darren has been involved in preparation of designs incorporating geosynthetics for a variety of applications and across a variety of sectors including waste, oil and gas, mining, urban development and transportation. Through this experience Darren has developed specialist knowledge helping to enable him to develop and implement innovative design measures involving geosynthetics.

Abstract

Alumina refining using the Bayer process produces bauxite residue, a high pH waste by-product. Disposal of this by-product has the potential to pose a risk to the environment. International best practice for containment of this type of waste product commonly involves the use of a composite liner system. This presentation discusses the challenges associated with design of a liner system for a filter press bauxite reside storage area in a remote desert environment.

Design and construction of a composite liner system in a desert environment poses challenges associated with sourcing clay and water in addition to durability challenges posed to containing a high pH waste. To help limit demand for water and clay a GCL/Geomembrane composite line was adopted in lieu of a Compacted Clay and Geomembrane composite liner conventionally used. To help support this innovative approach additional considerations were required to be made during design preparation and measures were incorporated in the design to address unique challenges posed by the application. This included:

- Accelerated exposure testing to assess durability of candidate GCL and geomembrane products
- Comprehensive and innovative quality assurance measures to ensure the materials used in manufacture of both geomembrane and GCL materials were consistent with those used in

ORAL ABSTRACTS

manufacture of samples provided for accelerated exposure testing
- Hydration trials to assess the ability for different site won subgrade materials to retain moisture sufficient to enable effective GCL hydration
- Control measures for placement of overlying drainage layer materials to help limit formation of geomembrane wrinkles in hot environment and adversely impacting the GCL.
- Measures using site won material to enable placement of filter press bauxite residue using earthmoving equipment without posing an unacceptable risk of damage to the liner system

The baseliner system design was successfully constructed within the projects budget and schedule requirements. In addition to cost savings the adopted design resulted in significantly reduced greenhouse gas emissions and water demand compared with a more conventional composite liner system without posing an additional risk to the environment.

Wednesday 2.40pm

Use of Asphalt Reinforcement in Heavily Loaded Container Terminal Pavements

Theron J[1]

[1]Huesker Australia

Biography

JP is the QLD Business Development Manager for HUESKER Australia. He holds two bachelor's degrees: Bachelor of Engineering (Civil) and Bachelor of Science (Agriculture). For the Engineering degree he specialised in pavement design and geotechnics, while the primary focus was on soil science and oenology during the Science degree.

He is a pavement engineer with four years of experience in the fields of pavement and geotechnical engineering and has been involved in a wide range of multi-disciplinary projects across Australia for clients such as Port of Brisbane, Australian Rail Track Corporation (ARTC), Department of Defence and Department of Transport and Main Roads. His experience includes new pavement design, rehabilitation design, site investigation and supervision.

Abstract

This paper presents a different perspective in pavement design and construction, based on a real-life project undertaken at a major Container Terminal in Brisbane, utilising an engineered asphalt reinforcement technology as an alternative to the traditional thick pavement design approach.

Pavements at container facilities are generally constructed on reclaimed land, costal swamps or marine environments developed beyond the natural shoreline. This case involves the construction of a brand-new terminal pavement built on a coastal swamp, using high levels of cement content in the cement-treated pavement base (CTB) to achieve the required level of pavement stability.

Asphalt pavements are commonly utilised at container terminals in Australia. When constructed over CTB, reflective and/or shrinkage cracking is a common phenomenon and a major challenge in asphalt pavements, traditionally addressed by using thicker

ORAL ABSTRACTS

asphalt layers. In this case, the risk of reflective cracking from the underlying CTB is tackled by a high-performance asphalt reinforcement geogrid material as per the adopted design approach, reducing the need for thicker asphalt layers.

The project highlights and exemplifies the following respectively:

A) The limitations of traditional/standard pavement construction materials are generally compensated by the increased quantities in which they must be used to deliver the required pavement performance as per the relevant traditional design approach.

B) In contrast, the required asset performance and serviceability for heavily loaded terminal pavements can be achieved as a function of pavement and material design, utilising specialty high-performance materials. This inherently reduces the use of non-renewable construction materials, with a significant opportunity to build more cost-effective and durable pavements.

Thursday 10.20am

Using Geotubes for improving the safety of tailings storage facilities and reducing footprint

Vuillier C, Omar N

Biography

https://www.linkedin.com/in/charles-vuillier-3621b318/

https://www.linkedin.com/in/norhisam-omar-b7124975/

Norhisam Omar, graduated with a Bachelor of Engineering from Universiti Teknologi Malaysia (UTM). Norhisam has extensive experience in the development and manufacturing of geosynthetics since 1997. He then took on the leading role in expanding in the Asia Pacific as Regional Business Manager of TenCate Geosynthetics Asia in the Water & Environment Division.

Abstract

"The understanding of where and how to use geotextile dewatering tubes within the mining sector continues to grow. This discussion outlines thinking on the use of geotextile tubes as new non-mechanical way to filter tailings.

This solution tailings storage facilities as a dewatering system whilst also providing dust and erosion free filtered tailings stack.

The construction technique offers a safer, more stable structure whilst reducing the footprint at economical cost"

ORAL ABSTRACTS

Thursday 10.20am

A modern approach to traditional geotextile seals: An advanced chipseal grid for high-performance reinforced sprayed seals and field verification in Australia

Kaya Z[1], Leite-Gembus F[2]

[1]Huesker Australia, [2]HUESKER Synthetic GmbH

Biography

Zehra holds a Bachelor of Science degree in Engineering with a specialisation in materials/ technical textiles, and has completed a Master's degree in International Business, at Griffith University, Queensland.

She has been a strong advocate for advanced design, construction, and maintenance practices within the infrastructure sector, driving and delivering meaningful change working collaboratively with the industry stakeholders across Australia.

Over the past eight years, she has worked on numerous projects in Australia and New Zealand with local road authorities as well as major and regional airports, where she has specialised in the use of engineered geosynthetic solutions in roads and aircraft pavements with a particular interest in pavement reinforcement to tackle the effects of reflective cracking in pavement structures.

In recent times, Zehra has also contributed to transformation of 100% recycled PET from post-consumer water bottles into engineered PET reinforcement geogrids for asphalt reinforcement and sprayed seal reinforcement, to further enhance their far-reaching sustainability benefits combined with increased durability based on field verification.

Zehra combines an in-depth understanding of materials, practical experience in the field, and a strong drive for innovative engineering solutions. She is currently focused on various projects around roads, ports and airfields, helping deliver increased asset performance together with responsible sustainability using geosynthetic solutions.

Abstract

Traditional geotextile seals have been widely accepted and used in Australia since their introduction in the 1970s to improve road surface performance as a waterproofing flexible membrane in sprayed seals.

The non-woven geotextile acts as a binder reservoir and thus allows higher binder application rates which provides improved strain relief and waterproofing capabilities. This results in prolonged service life of the sprayed seals, reducing the need for more extensive rehabilitation treatments particularly on cracked or deteriorated pavements prone to water intrusion. Nevertheless, a geotextile is only able to act as a moisture barrier and protect the underlying pavement asset if it is fully impregnated with bitumen and if it remains intact during the expected service life of the surfacing.

This paper focuses on the development and implementation of a more advanced geosynthetic solution for sprayed seals, a chipseal grid system, which incorporates a sealing grid into the geotextile. This combination provides two key additional benefits while overcoming the shortcomings of the geotextile system: reinforcement function from the geogrid, and improved resistance of the geotextile-sealed system to tensile stresses created, such as those induced by dynamic loads, under serviceability conditions.

In the first part, the paper will examine prior field experience with traditional geotextile seals, the practical need for a more robust system especially under heavy loads and demanding conditions. Additionally, the differences in geogrid and geotextile material properties and functions will be presented, confirming the benefits of a chipseal grid reinforced system in providing a surface more resistant to traffic-induced stresses than a traditional geotextile seal on its own.

In the second part, it will present a comparative case study from Queensland in Australia, demonstrating the implementation and performance of the newly developed chipseal grid product in a double/double reseal over a major highway pavement with severe cracks and surface defects as part of a real-life project that has been independently assessed and recorded by the local road authority through visual inspections.

Finally, the paper will examine limitations associated with the use of this new technology in resurfacing of deteriorated pavements, identify opportunities for further field work and offer recommendations around selection criteria for best utilisation of its identified benefits in sprayed seals as an advancement from the traditional geotextile seals.

ORAL ABSTRACTS

Thursday 10.40am

Use of HDPE Vertical Barrier Wall for Remediation of Hazardous Waste Dumpsite

Ng H[1], Su J[1], Wang W[1]

[1]Solmax Geosynthetics Co. Ltd.

Biography

Mr. Hermann Ng Hoe Boon graduated in Civil Engineering from the National Cheng Kung University, Taiwan and obtained Master Engineering in Geotechnical Engineering at Asian Institute of Technology (AIT), Thailand. Mr. Ng practiced as a geotechnical engineer in Malaysia for almost a decade before joining GSE Lining Technology Co. Ltd. – a leading geosynthetic manufacturer, he is currently Sr. Technical Manager of Solmax Geosynthetics Group. Mr. Ng has been involving in the geosynthetics business for more than 15 years, providing engineering advices and support to engineers, consultants, contractors, authorities and his clients in Asia-Pacific. He is a Professional Engineer registered under Board of Engineers, Malaysia (BEM), and an active committee member of International Geosynthetics Society – Malaysia Chapter (MYIGS). Mr. Ng is also members of institutions include BEM, Malaysian Geotechnical Society and IGS-Thai Chapter. He has authored and presented a number of technical papers in several conferences, geotechnical and environmental engineering journals.

Abstract

Liquid contaminants can migrate through the soil matrix and leach into groundwater, while solid and semi-solid pollutants may be transported and dispersed through the subsurface, eventually poses threats to human health and the environment. Underground containment barriers are an important method of limiting or eliminating the movement of contaminants through the subsurface. Subsurface barriers can maintain the volume of waste and reduce the potential for migration into the surrounding geologic media, or groundwater. High density polyethylene (HDPE) geomembrane which is known for its water-tightness and good compatibility with most chemicals, has been widely used as low permeable barrier to stop or limit the migration of liquid contaminants and chemicals out of the containment area. In recent years, HDPE vertical barrier CurtainWall system has been successfully constructed for cleanup works at waste dumping sites in China. HDPE geomembranes which has been prefabricated in panel form are inserted into the excavated trench, and through the interlocking system, wall panels are securely connected to form a continuous vertical barrier wall in the ground. HDPE CurtainWall works more effectively with the bentonite mixture to form a composite barrier system. Because of its secured interlocking system, very low hydraulic conductivity and superior chemical resistance, HDPE CurtainWall has been widely chosen as a good candidate for containing hazardous subsurface fluid plume and aqueous contaminants, providing an immediate protection to the subsurface environment and underground water. This paper presents the construction of HDPE vertical barrier CurtainWall system at an industrial waste dumpsite located in China. The lesson learned obtained from the field experience provides reference for HDPE vertical barrier wall construction and application in the future remediation of contaminated sites.

ORAL ABSTRACTS

Thursday 10.40am

Effective geosynthetics solution for pit thermal energy storage

Su J[1], Ng H[2]

[1]Solmax Geosynthetics Sdn. Bhd., [2]Solmax Geosynthetics Co. Ltd.

Biography

Su Jong Hao graduated from Universiti Tenaga Nasional (UNITEN) with a first-class honours degree in Civil Engineering. He joined the geosynthetics industry since 2012 and has gained about 10 years of experience in the geosynthetic applications. He has experience in various design with geosynthetic materials in infrastructure, hydraulic and environmental engineering applications in the Asia-Pacific region. Mr. Su joined Solmax Geosynthetics in 2019 and has been responsible for providing technical support and development of value-added products in the region with focus in Malaysia, Vietnam & Oceania. He is also an active member of International Geosynthetics Society – Malaysia Chapter (MYIGS) and ACIGS (Australia). Mr. Su has authored and presented several papers on various geosynthetics applications in both local and international conferences.

Abstract

As per the International Energy Outlook 2021, consumption of renewable energy is projected to increase more than double from 2020 to 2050 globally, and the renewable energy sources are expected to grow nearly the same level. Utilising renewable energy sources such as solar and wind-generated electricity in a stand-alone system requires corresponding storage capacity, especially the variable nature of renewable energy generation could bring challenges in terms of security of supply and electricity price volatility. It is therefore necessary to establish energy capacity back-up to accommodate periods of low renewable energy sources generation. Large scale seasonal thermal storage used to capture excess solar energy is a growing renewable energy source to cope with the increasing energy demand. This paper will focus on pit thermal energy storage (PTES) system that uses water a storage medium to store energy. The stored heat capacity is among the highest in the few currently available underground thermal energy storage systems. Geosynthetics with high temperature resistance is a critical component in contributing to the success of PTES. The paper showcases the containment system that involves several types of geosynthetics, inclusive of high temperature resistance polymeric liners and geocomposite drainage material in forming the PTES. A case study of PTES constructed using geosynthetics at 4,600m above mean sea level will be discussed in this paper. This economically sound PTES project can be an energy storage reference to the region, particularly in reducing the country's reliance on fossil fuel, furthermore, contributing to a sustainable energy development of the nation.

ORAL ABSTRACTS

Thursday 11.00am

Hydration Behavior of Geosynthetic Clay Liners (GCLs) Manufactured with Laboratory Type Needle Punching Equipment

Taskesti B[1], Polat F[1], Ören A[2]

[1]The Graduate School of Natural and Applied Sciences, Dokuz Eylül University , [2]Department of Civil Engineering, Dokuz Eylül University

Biography

Bilal Enes Taskesti is presenter who works for 4.5 years on hydration performance of geosynthetic clay liners over compacted subsoil. He has conducted PhD study in Turkey. Meanwhile, Bilal Enes Taskesti got PhD offer from Monash University and he started his PhD study at Monash University on February, 2022. Presented study was conducted when he was in Turkey.

Abstract

Geosynthetic clay liners (GCLs) are widely used in waste containment facilities over the last two decades to prevent contaminant transport to groundwater. Low permeable feature of bentonite gains barrier property to GCL. Hydration of GCL over compacted subsoil also contributes to barrier property. GCLs absorb water from underlying soil after installation and thus, the water content of GCL increases. Although several factors influencing the hydration behavior of GCLs have been studied so far, investigation of the hydration behavior of GCL based on mass per unit area (MPUA) and needle punching density (NPD) is limited and it deserves more attention. In this study, the influence of MPUA and NPD was investigated on a single GCL (P-GCL) containing polymer modified bentonite. Many GCL samples were cut from GCL roll which was supplied from local GCL manufacturer in Türkiye. Since determined MPUA value for each sample was in narrow range (4.0-4.5 kg/m²), MPUA range in this study was widened manufacturing A-GCL in the laboratory. To do so, laboratory type needle punching equipment was designed. Hence, MPUA range was kept between 3.0-7.0 kg/m². Laboratory type needle punching equipment also enabled GCL to be manufactured at different NPDs. It is not so easy to determine NPD of original P-GCL. Thus, A-GCLs with MPUA of 4.0 kg/m² were manufactured at NPD of 5.0, 10 and 15/cm². Note that bentonite extracted from P-GCL was used in manufacturing of A-GCLs in the laboratory. After manufacturing process was completed, A-GCL samples with a diameter of 100 mm was cut from rectangular GCL panel to use in hydration tests. Silty sand soil which was taken from near of Aydın Municipal Solid Waste Landfill was compacted at 2% wet side of optimum in PVC mold. GCL, polyoxymethylene cap instead of geomembrane was placed over compacted silty sand, respectively. Then, system was sealed with thick plastic bags and O-rings to prevent air entrance and exit. Seating load corresponding to 1 kPa vertical stress was applied on the system. Hydration tests lasted 30 days and mass measurement of GCLs within this period was performed at various time intervals to monitor change in water content with time. Based on the test results, the hydration behavior of A-GCL with NPD of 15/cm² was observed to be closer to that of original P-GCL. Once, NPD was determined, then A-GCLs with various MPUAs were manufactured using laboratory type needle punching equipment. The hydration tests were run on these samples. A-GCL with low MPUA had higher water contents than that with higher MPUA throughout 30 days. When final water contents of A-GCLs were evaluated depending on the MPUA, it was observed that increase in MPUA led to decrease in final water content of A-GCLs.

ORAL ABSTRACTS

Thursday 11.00am

The Role of Geosynthetics in Combatting the Effects of Global Warming

Sangster T[1]

[1]Downley Consultants Ltd

Biography

Tom Sangster is a professionally qualified Civil Engineer with 35 years' experience in geosynthetics and geotechnical engineering and is Managing Director of Downley Consultants, an internationally renowned consulting engineer specialising in geosynthetics and trenchless technology projects. Mr. Sangster gained a Bachelor's degree in Civil Engineering at the University of Surrey in 1978 and became a chartered civil engineer in 1983. He also holds an MBA from a leading UK business school. His early career was spent in design of water supply and wastewater systems and in geotechnical and foundations contracting. He also gained senior sales and marketing experience with companies manufacturing geosynthetics for civil engineering applications.

He has undertaken and managed many geosynthetics projects throughout the world. His experience in geosynthetics encompasses innovative applications, contract and risk management, international standardisation and product development. He is based in Nyon, Switzerland.

Abstract

Goals set at climate conferences such as COP26 in Glasgow in 2021 include grand statements about what must be done in or by 2035 or 2050. This lulls us into a false sense of security; global warming is something that will happen 15 or 30 years in the future so nothing to worry about now. This is indeed false; the effects of global warming are right here and right now in the form of more frequent and more severe weather events. In the space of just one month in 2021 severe floods killed almost 200 people in Germany, similar floods trapped people underground in a metro train in China, 12 were killed, and in Canada the town of Lytton saw the highest ever recorded temperature in Canada and was the following day destroyed by a wildfire. Australia has also suffered serious wildfires, droughts and floods.

There is a clear need for physical infrastructure to manage water, both excess water in storm and flood events and conserving water where it is a precious resource. Conventional water management infrastructure uses a lot of concrete. This is simply unsustainable; if the cement and concrete industry were a country it would be the third largest emitter of carbon, accounting for approx. 8% of anthropogenic carbon emissions. Using concrete to deal with the effects of climate change simply contributes to making the underlying problem worse; this is the exact opposite of sustainability. And hard armour solutions using riprap deplete natural resources.

Geosynthetics are a key part of the solution. They enable the effects of climate change to be managed sustainably and cost-effectively. The presentation will show how geosynthetics result in more sustainable solutions than using conventional materials in water management. It will draw on life cycle analysis research in Europe comparing carbon emissions in a range of projects. Examples will be included of storm water channels and storage facilities, coastal protection and water conservation and storage works.

The presentation will also show that, in addition to reducing CO_2 and other emissions, reducing natural resource depletion and reducing energy demand, using geosynthetics can reduce construction costs and the impact on residents living near the works. It will also discuss how the environmental impact of geosynthetics themselves may be reduced. They are plastic products and the potential for using recycled polymers and natural fibres will be reviewed.

ORAL ABSTRACTS

Thursday 11.20am

A sensitive mine closure in Canada - analysis after 15 years of completion using a multi-linear drainage geocomposite for surface water collection

Saunier P[1], Fourmont S[1], Warwick A[1]

[1]Afitex-Texel Geosynthetics Inc.

Biography

Pascal Saunier is a French-Canadian professional engineer. After having managed a waste management facility, Pascal moves in Québec and continues to develop his expertise in the geosynthetics industry with AFITEX-TEXEL inc., the Canadian manufacturer of DRAINTUBE™ technology, where he takes the lead of the business development for North America and Pacific. Pascal Saunier cumulates almost 20 years of experience in the area of the geosynthetics.

Abstract

The Crown mine, later part of the Eustis mine, opened in 1865. It is located in the Eastern Townships region of Quebec. When the Eustis mine ceased operation in 1939 it was the deepest copper mine in Canada. It was also the last operating mine in the region's mine complex and also the oldest copper mine in Canada. The mine remained an Orphean site until 2006 when the government of Canada, in coordination with Ministry of Natural resources, decides to invest 3 m$ for its remediation by a final closure. Heavy metals leachates were still leaking into the Massawipi River and nothing was growing on the acidic soil of the site.

The goal of the remediation was to close the mine with a HDPE liner and reduce the leachate generation by cutting the rainfall infiltration into the waste deposits. A drainage layer is required on top of leak proofing systems. It limits the amount of water infiltration through potential defects in the geomembrane, and improves the stability of the cover, avoiding saturation of the cover soil.

The Draintube multi-linear drainage geocomposite has been selected as the most efficient and cost-effective solution for the drainage layer. It has been installed directly on the geomembrane. This solution provides long term drainage performance as Draintube is not sensible to creep in compression, nor geotextile intrusion. It also gives the possibility to perform a leak location survey on the geomembrane, even after installation of the soil layer.

After 10 years of use, an investigation is made on the components of the product to establish that it is still performing as expected, especially considering the opening filtration size of the filter and the flow capacity of the product.

ORAL ABSTRACTS

Thursday 11.20am

A short overview of microplastics and nanoplastics presence in landfill leachate

Soleimani E[1]

[1]Monash University

Biography

Elham is a PhD. Researcher and Environmental Engineer/Scientist with over ten years' experience as an environmental consultant. Elham received her B.Sc in Environmental Engineering from Tehran Environmental University, Iran, in July 2004 and Bachelor of Environmental Science from Azad University, Science and Research Branch, Tehran in March 2016.

Elham is working on microplastics characteristics, migration, accumulation, serving as vector and media for contaminants and fate of MPs in landfill leachate under the supervision of Prof Abdelmalek Bouazza (principal supervisor) and Prof Mark Monroe Banaszak Holl (associate supervisor) from February 2021.

Her M.Sc. research was waste-to-energy, calculating and implementing Methane emission potential &extractable energy of solid waste landfill, LandGem modelling - producing 2MW electricity led to a 50% CO2 emission reduction (Halghe Dareh landfill).

Elham's area of expertise is in waste management and landfill design, monitoring and auditing, and environmental consulting within a broad range of industries and applications, including due diligence, statutory compliance, EES, EMS and EMPs, contaminated land & site with private and public centres in various industries (oil& gas, petrochemical, mining, automotive, pharmaceutical, food, construction, cement, wind and solar farm).

She has valuable extensive working experiences with roles in numerous environmental development projects, waste management and landfill audit and environmental and sustainability management. She has years of experiences as an Environmental Consultant with EPAWM, RSA and KWM consultancy companies in Iran (Tehran). After moving to Australia in 2016, Elham joined GHD (Melbourne) as an Environmental Engineer and worked with waste management and landfill audit and environmental and sustainability audit team. Also, Elham has valuable experiences as a Senior Professional Environmental Scientist with AECOM (Melbourne) regards to working on environmental projects with both Geoscience & Remediation Services and Impact Assessment & Permitting team.

Abstract

Microplastics (MPs) and nanoplastics (NPs) are emerging pollutants and are defined as plastic particles with a size of less than 5 mm (NPs have a size <0.1µm). They have received a great deal of concern from the scientific community and the general public regarding their potential impact on the environment.

Microplastics and nanoplastics (MNPs) have been identified in leachate from active and closed landfills, which are the major storage and scattering of primary and secondary MPs. Polyethylene (PE), Polypropylene (PP), Polyvinylchloride (PVC), Polystyrene (PS), and Polyethylene terephthalate (PET) are the most common types of MNPs identified in landfill leachates, which also account for 80% of Australian plastic demand, buried in landfills.

Microplastics have been documented as a well-known vector for transporting inorganic contaminants, and recent studies focussing on hydrophilic compounds, such as pharmaceuticals and personal care products (PPCPs), have shown that the organic contaminants have the ability to be adsorbed onto plastic surfaces, migrate through landfill liners and desorb in the various environmental matrix. MNPs can be transported or introduced into the soil and groundwater and consequently migrate in surface water in numerous ways, such as leachate discharges. Besides, there are growing concerns regarding their potential adverse effects on ecosystems and human health.

Thus, addressing MNPs' occurrence, fate, migration behaviour in landfill leachate is essential to achieve the best mitigation strategies, which call for more research, and innovative technology in the geotextile industry.

Keywords: Microplastics; Nanoplastics; landfill leachate; Geotextile, organic contaminants.

ORAL ABSTRACTS

Thursday 11.40am

Sino Iron Case Study: Changing from Composite PE liner system to BGM

Du Preez L[1], Herbert R

[1]WSP Golder

Biography

Liza du Preez is a Principal Landfill, based in our Perth office. Liza has more than 24 years' experience in solid waste handling and landfill engineering. She has dealt with municipal, industrial, hazardous and mine waste. Her extensive design experience includes landfills, bioremediation facilities, containment ponds and structures and landfill gas mitigation systems related to infrastructure development. She also has many year's experience in construction monitoring, site management, operational and long-term development planning and, closure related to waste management facilities She has a particular interest, and 24 years' experience, in the use of geosynthetics in landfill and containment pond liners, tailings storage facility liners and landfill caps, etc., which includes design, assessment, specifications and installation quality assurance.

Abstract

Sino Iron is the largest magnetite mining and processing operation in Australia and is located approximately 80 km south-west of Karratha in the Pilbara region of Western Australia. The open pit mine produces ore that is put through a beneficiation process on site. The tailings product produced through the crushing and beneficiation of the ore is deposited in a large tailings storage facility (TSF) on site. The TSF embankment is constructed in a downstream direction in 3 m lifts using various run of mine waste rock obtained from the pit excavation. Due to the granular nature of some of the overburden construction materials, and to minimise potential seepage through the embankment, a liner system formed part of the design along the northern and western flanks for the TSF. Chemical analysis of the seepage water indicated that it wasn't aggressive and had a relatively neutral pH and was unlikely to cause environmental harm. Due to the volume of the seepage during and soon after storm conditions and given the granular nature and potential variability of the subgrade, a flexible liner was required to manage the seepage. For this reason, a composite liner consisting of linear low-density polyethylene (LLDPE) and a geocomposite clay liner (GCL) was selected in support of the design to line the upstream slopes. This use of this liner system continued for a period of time, but due to tenement restrictions and space constraints, the embankment slopes had to be steepened to provide the required storage capacity. At this time, it was decided that a composite liner would no longer be suitable, leading to a subsequent modification of the liner system to allow installation of a bituminous geomembrane (BGM). This paper presents the installation of the original composite liner system, the challenges with changing from one liner system to the next and the installation challenges associated with the BGM liner system.

ORAL ABSTRACTS

Thursday 11.40am

Liners and covers for reservoirs – evaluation and replacement

Sadlier M[1]

[1]GCA

Biography

Mike Sadlier graduated in Civil Engineering from RMIT in 1973 and has been involved for almost fifty years in civil and geotechnical engineering design, construction and project management with organisations including Frankipile, Humes, Johns Perry and Leighton both in Australia and Asia. Projects have included specialised foundations and retaining structures, membrane liner systems as well as general civil engineering and building works.

He has been using geotextile fabrics and synthetic membranes since the 1972 and was engaged in geosynthetic market and technical development with Polyfelt Geosynthetics Australia from 1983 to 1992 working with both Polyfelt geosynthetic products and Gundle HDPE geomembrane lining products. During this time he was a member of the Polyfelt International Technical Working Group steering applications R & D, technical servicing and geosynthetic design activity. He was responsible for Polyfelt technical services in Australia and SE Asia and was responsible for the design and construction of the first large membrane covered anaerobic lagoon at Werribee in 1992.

He has published some fifty conference papers on geosynthetics including the last nine International Geosynthetic Conferences at Vienna, Den Hague, Singapore, Atlanta, Nice, Yokohama, Brazil, Berlin and Seoul in 2018. He has also acted as session chairman at various conferences and workshops including the more recent IGS Conferences and has presented keynote lectures at various Conferences. He was a member of the Standards Australia Committee on geotextiles and geomembranes and in that role has attended ISO meetings on international standards. He recently retired as an elected council member of the Management Council of the International Geosynthetic Society and is immediate past Chairman of the IGS Technical Committee.

In 1992 he established Geosynthetic Consultants Australia, an independent specialist consultancy dealing with project management, quality management and other aspects of geosynthetic application and development. Major project works have included floating covers for water storage and anaerobic digestion with gas harvesting as well as major landfill, and other projects for mining, environmental and infrastructure works. Projects have been located around the world including Australia and New Zealand, Europe, South America, Asia and most of South East Asia.

He also works on occasions as a casual employee for major engineering groups including SMEC and GHD.

He has worked and traveled extensively in Australia, New Zealand and South East Asia including locations such as Indonesia, Malaysia, Vietnam, Philippines, Thailand, Singapore, Hong Kong and South Korea.

Michael (Mike) Sadlier
Geosynthetic Consultants Australia, Melbourne Australia sadlierma@gmail.com.

Abstract

Many water supply reservoirs that were built in the last twenty years or so made use of liner and cover materials that were based on flexible polypropylene in both unreinforced and reinforced formats. These materials have suffered over time as a result of aggressive UV light exposure and exposure to chlorinated and chloraminated water.

The first part of this paper will discuss sampling and testing strategies that may be adopted in order to make realistic evaluations of the state of these materials leading to an assessment of remaining service life and the need for timely replacement. Many of the aged flexible polypropylene materials have become very difficult to seam and work with such that smaller scale sampling strategies my help and larger samples may require repairs that are difficult to effect or may even require mechanical patching.The paper will discuss analytical testing such as OIT or HPOIT as well as the choices of mechanical test methods if larger samples can be obtained.

The second part of the paper will discuss the current range of available liner and cover materials with a substantial focus on the options not based on polyethylene. For liners this will include the polyethylene materials and their current manifestations as well as alternatives including PVC/ Elvalloys, BGM materials and coated fabrics. For

covers this will include CSPE, PVC/Elvalloys and the newer versions of reinforced polypropylene with much improved testing performance compared to their predecessors.

The final part of the paper will discuss the trends in renovation of water storages which are seeing more and more use of double liner systems for better leakage control as well as the use of conductive materials to enable electronic leak detection surveys. The result is leakage rates that are approaching ever closer to zero - a desirable result in urban environments.

References

Sadlier M.A, Scheirs, J, Hay, B. (2014) "Enhanced HDPE and Subgrade Requirements" 10th International Conference on Geosynthetics – 10ICG, Berlin Germany, September 2014

Sadlier, M.A. (2017. "Geosynthetics in Mining and Environmental Applications" Invited Lecture for Geosintetik 2017, Jakarta Indonesia, October 2017

Sadlier, M.A., Frobel R.K (2018) "Current Developments and Trends for Water Reservoir Renovation with Geosynthetics" 11ICG, Seoul, South Korea, October 2018

Thursday 1.00pm

Challenges in Establishing Longevity Criteria for White/ Black Geomembranes in Critical Contaminant Storages

Amtsberg M[1]

[1]Atarfil Australia

Biography

Marc began life as a Geophysicist, studied Civil Engineering while working for one of the big miners and combined the two in various mining project roles for over a decade. He has worked for a range of mining companies on over 50 sites Australia wide, largely as a glorified project manager rather than contributing anything to the greater good.

He joined Geofabrics in 2005, working with their landfill and mining technical teams, and has provided technical support to Atarfil Australia since 2019. His particular area of focus has seen a focus on product manufacturing inputs and link them to project design life. This has included most recently the polymer formulations for Geomembranes, Geotextiles and Geonets, and Bentonite raw and processed material research for Geosynthetic Clay Liners.

He has written a number of papers on Geosynthetics in Tailings and Landfill design, an awarded paper on Tailings GCL Exhumations at ANZ Geomechanics, and toured a National Thought Leaders Seminar on Safe Tailings Design for Engineers Australia in 2019.

Abstract

The aim of this presentation is to identify key challenges in current methods to establish design durability of HDPE Geomembranes in key infrastructure projects. The product focus will be on White/Black Geomembranes and projects discussed will include Coal Seam Gas Concentrated Brine Storages, Acidic Mine applications, and Caustic storages associated with Bauxite Residue Storages.

The presentation will highlight some key assumptions made in Geomembrane design and pre-project testing used to establish longevity criteria. Results to date indicate that care should be taken in using short term test data for Arrhenius plots to establish long term design expectations. The presentation

ORAL ABSTRACTS

will review results achieved when comparing short term accelerated test methods against long term pot immersions and draw some key conclusions around the need to test White and Black layers as single, homogenous samples or treat them as separate entities. The conclusions will support certain design thinking in the Australian Mining Landscape for critical mining waste storages.

Thursday 1.00pm

Spoil management in confined areas with GeoTubes – Case Studies

Marais B[1]

[1]Desilting Solutions Pty Ltd

Biography

Brett is a qualified Civil engineer with a Maters degree in engineering. Having started his career in South Africa he worked fro the local authority in their roads department. He immigrated with his family to Australia in 2005 where he worked for GHD Consulting Engineers before going over to the 'dark side' and becoming a civil contractor. After contracting for 10 years he decide to go out on his own and started Desilting Solutions PL who, with their Australian first 'Remotely operated underwater robotic dredge', specializes in the desilting of submerged structures. Along with the specialized dredge equipment Brett has also utilized GeoTubes for spoil management in most cases and has built up his knowledge base utilizing these tubes in often very unusual and technically challenging projects.

Abstract

With the densification of urban areas and the ageing of infrastructure maintenance is becoming more and more of a logistical challenge. Generation of spoil from these maintenance activities, in whatever form, places the contractor or asset owner, depending on the contractual arrangements, in potential conflict with both their environmental responsibility as well as social interactions which inevitably can add hugely to project costs.

Management of spoil is becoming a specialised and expensive component of any contract and is further compounded by the addition of water, as If the spoil is saturated, for example through the removal of submerged sediment, the situation becomes even more challenging. Costs of disposing large amounts of saturated and often, contaminated spoil, has the potential to become one of the costliest and riskiest parts of any project.

Technologies, within an urban context, offer in terms of solutions, extremes with complicated water treatment plants on the one side and simpler more robust options on the other, both have their place and application,

ORAL ABSTRACTS

however simpler is often better.

This paper examines three projects in detail, in terms of both cost and risk, where spoil management formed the cornerstone to these maintenance works and where GeoTubes, of different sizes, were utilised to efficiently and successfully manage large quantities of water laden sediment, all within densely populated or highly developed urban areas.

The three projects are:

1. Desilting of the Black Street stormwater pipe, a 3000mm stormwater pipe which runs from Suncorp stadium into the Brisbane River. GeoTubes located on a barge in the Brisbane River: Client Brisbane City Council.
2. Desilting of Forest Lake inflow areas, very restricted areas with resident interface. Client Brisbane City Council
3. Desilting of a 1600mm culvert in Townsville, industrial area, limited access. Client Port of Townsville

Thursday 1.20pm

Performance of Geosynthetic Clay Liners in high risk applications

Shahkolahi A[1], von Maubeuge K[2]

[1]Global Synthetics, [2]NAUE GmbH & Co. KG

Biography

Amir has a Bachelor's and Master's degree in Civil and Environmental Engineering and fellow member of Engineers Australia. As a designer, project manager and researcher, he has been involved in civil and geosynthetic industry over the last 20 years. He is the National Technical Manager at Global Synthetics. Amir is currently the chair of the Australian Geomechanics Society (AGS)-QLD Chapter, board member of the American Society of Civil Engineers (ASCE)-Australian Section, Industry Board member of the Australian Pavement Research Hub, Board member of ARC Training Centre for Advanced Technologies in rail Track Infrastructure (ITTC- Rail), member of the Standards Australia Technical Committee CE/032-Reinforced fill structures working group, and member of the ASTM Technical Committee D35-Geosynthetics. He is also a board member of the International Geosynthetic Society Technical Committees for Barriers (TC-B), board member of the QLD Landfill Working Group, board member of the Waste Management and Resource Recovery of Australia in QLD, member of the International Geosynthetic Society Technical Committees for reinforcement (TC-R) and Stabilisation (TC-S), university guest lecturer on geosynthetics, part time PHD researcher, and the industry supervisor and advisor for several geosynthetic and geotechnical research projects in Australia and overseas.

Abstract

Geosynthetic Clay Liners (GCLs) have been used successfully as a reliable sustainable alternative to Compacted Clay Liners (CCLs). Although GCLs can improve the performance and reduce the risks of the liner system compared to CCLs, they are exposed to some other short term and long term risks that can affect the performance of the GCL if not addressed and controlled during the design stage. The definition of high risk for GCLs depends on the application as well as conditions where the GCL is being used. This paper reviews the applications and conditions where GCLs can be considered at high risk, and presents the short term and long term effect on GCL performance. At the end, some suggestions on how to address these in the design stage and control the effects will be provided.

ORAL ABSTRACTS

Thursday 1.20pm

Design Challenges of a Geomembrane Lined and Covered Hot Water Thermal Storage

Fairhead G[1], Pece D[1]

[1]Fabtech Australia

Biography

Graham is a qualified Engineer and has held executive positions in Manufacturing, Design, Engineering, Sales & Marketing and General Management internationally across Europe, America, and Australia. Having join Fabtech as its Managing Director in 2007 Graham has led the development and growth of Fabtech to become Australia's leading geosynthetics Installation Company. Graham also leads the technical group within Fabtech which is focused on materials, barrier system design and floating cover design. The foundations of the company's growth have remained consistent being technical leadership, customer retention, safety and quality. Graham's previous roles in design and manufacturing on an international basis have been the foundation for Fabtech's on-gong focus on geosynthetic material manufacturing quality control and quality assurance strategies. This expertise has been applied to over 30 projects including multiple production audits in Asia, China, USA, Middle East and Australia. Currently and officer of ACigs, Immediate Past President and chair of the membership committee Graham has authored several geosynthetic technical papers and is regularly requested to speak as an industry expert.

Abstract

Geomembrane barrier systems are used in lined and covered water storage applications to minimize water loss through seepage and evaporation. This paper addresses the additional design requirements, and solutions, when the stored water is at elevated temperature. In this application heat loss would reduce the round trip energy efficiency and was required to be minimized providing a thermal insulating barrier. Heat transfer, insulation and geomembrane durability were therefore additional design requirements. Selection of a suitable specialty geomembrane providing durability in contact with the stored water at 95 deg C was necessary. Conductive geosynthetic materials were used in critical locations to allow high sensitivity electrical integrity surveys allowing low seepage assumptions to be used in optimizing the design. The design of insulating layers to reduce heat losses also incorporated vapor barrier layers to assist in managing the increased vapor transmission of water through HDPE geomembrane at elevated temperatures. Drainage and micro water extraction systems were incorporated in the insulating layers. The insulating floating cover needed innovative rainwater management solutions as the insulating layer and restrictive operating parameters necessitated minimal cover deflection when in operation preventing the use of conventional floating cover rainfall management and removal solutions.

ORAL ABSTRACTS

Thursday 1.40pm

Geosynthetics in Mining Applications in Africa

Zannoni E[1]

[1]KNIGHT PIESOLD

Biography

Professional Engineer and Business Manager with more than 10 years of experience in South Africa and Africa in the civil and mining sectors able to establish and grow double the T/O of business as well as secure, develop and delivery major projects managing both the engineering and the team. Able to restructure and meet budget over a period of 2 years for South Africa inland branch, developing a team and internal and external strategies focused on margins, cost reductions and market share. Able to create, develop and manage teams based on risk benefit approach. In-depth knowledge of geosynthetics and geotechnical engineering, especially in soil reinforcement and ground improvement. Active role in national and international engineering societies and responsible for main key accounts in South Africa.

Abstract

Geosynthetics have been used for at least five decades in mining related developments, predominantly to strengthen haul roads over unconsolidated sands and soft clay foundations. Crusher walls have been built with geogrids to provide access to the dumper trucks, reaching more than 30m in hight with a vertical front face, where geocomposite drainage has also been used to manage the pore pressure within the fill. In the last two decades barrier system to prevent contamination of the environment have been implemented in tailings storage facilities (TSF) and to retain water in return water dams to be used in the mining process. Whilst the use of geosynthetic barriers in mine closure is scarce, erosion control blankets have provided support for dust suppression and rain erosion where progressive closure is being implemented, as well as providing erosion protection over canals and spillway. Projects from South Africa, Ghana, Botswana and Zambia, to name a few, will be presented to highlight the benefit geosynthetics provided to the project as innovative solutions, but also in terms of cost-benefit and sustainability compared to other traditional alternative considered. The role of geosynthetics for risk mitigation in terms of design, supply and construction of these projects wall also be highlighted.

Thursday 1.40pm

The Efficiency of Using Air as a Permeant when Testing Hydraulic Properties of Geosynthetics

Allen S

[1]Tri Environmental, Inc.

Biography

Sam Allen is a professional with a background in chemical and materials engineering, with a specialization in the field of polymer testing and geosynthetics. Presently Mr. Allen serves as the Vice President for TRI's Environmental Group, a series of global laboratories providing routine conformance testing services and chemical compatibility testing as well as sponsored R&D supported by government and industry. He is a member of the ASTM International's D35 Committee on Geosynthetic Materials. Over the last two decades, Mr. Allen held committee leadership positions including D-35 Chair, Vice-Chair and Sun Chair. Mr. Allen has also served the Convener of Working Group 5 on geosynthetic durability within ISO TC221. He currently serves on the Technical Advisory Board of Geosynthetics Magazine, a geosynthetics industry technical trade publication. In addition, he serves on the Board of Directors of the Geosynthetics Institute in Philadelphia, Pennsylvania, and is a member of the International Geosynthetics Society's Council serving as Communications Chair.

Abstract

With the recent modifications to both ASTM D4491 (Standard Test Methods for Water Permeability of Geotextiles by Permittivity), and ASTM D4751 (Standard Test Method for Determining Apparent Opening Size of a Geotextile) to allow the use of a porometer, the practice of using air as a permeant is gaining popularity and traction in the geosynthetics testing community.

Numerous benefits are being realized in laboratory measurement ease, speed, quality and repeatability. In addition, many new benefits of using air as a permeant have been investigated with similar qualitative improvements.

This paper will review the physical and formulaic foundation for using air as a permeant to express hydraulic behavior using the Characteristic Flow

ORAL ABSTRACTS

Equation (CFE) as a basis. A procedural review of the changes in both ASTM D4491 and ASTM D4751 will be presented highlighting the use and utility of air as a permeant.

Next, quantitative examples of improved laboratory measurements using air as a permeant will be presented with processes for correlations between air and water tests explained.

Finally, a procedure for using the air permeant for hydraulic transmissivity/planar flow tests will be presented with a detailed explanation of result calculations based on the CFE. A description of the required modifications to standard ISO and ASTM test equipment and associated flow meter requirements will be described. The use of air-flow tests will also be discussed in the broader scope of its contribution to accelerated time-dependent testing with considerations of needed standardization.

Thursday 2.00pm

Construction of BGM-lined water supply dam in a very high rainfall and seismic region

Johns D[1]

[1]KCB Australia Pty Ltd

Biography

David is a geotechnical engineer with 17 years consulting experience in tailings management. His experience is focussed on the design, construction, and operation of upstream-raised tailings dams, dry stacks, earthfill tailings dams, water dams and waste rock dumps in Australia, Africa, South America, and Papua New Guinea over a wide range of seismic, geologic and climatic conditions.

Abstract

The author designed and constructed a water supply dam at the Ok Tedi Mine in Papua New Guinea on a potentially liquefiable tailings deposit in a highly seismic, mountainous area. The site's annual rainfall is 10 to 12 metres. The dam is lined with a bituminous geomembrane liner (BGM) which acts as an essential dam safety feature, to prevent saturation of the tailings foundation and subsequent earthquake liquefaction. The high rainfall posed a significant challenge to achieving a high-quality geomembrane installation. The installation was carried out by an Australian contractor using local labour, most of whom had never before installed liner of any kind.

The paper describes the design considerations and liner selection process, as well serving as a case history of a challenging construction in a high rainfall climate. Factors in the selection of the BGM are described. These include tear and puncture resistance to withstand installation damage imposed by the labour force on the poor-quality subgrade; the need to seam the liner in wet weather with unskilled labour and an inexperienced contractor; future maintenance and repair; and consideration of worker slips and falls during installation in rain which was noted to be a concern with alternative geomembrane types, such as HDPE.

The liner CQA process is also described, which included non-destructive and destructive tests.

Based on readings from the piezometers installed

ORAL ABSTRACTS

in the foundations and the rockfill dam, the liner is functioning as intended with an acceptably low rate of leakage. The author continues to monitor the dam's performance and carry out regular dam safety inspections.

Thursday 2.00pm

White Polyethylene Geomembrane: It lasts longer

Ramsey B[1]

[1]Boyd Ramsey Consulting LLC

Biography

Boyd Ramsey has been deeply involved in the geosynthetic industry for over three decades. He has held many leadership positions with the Geosynthetic Institute, the Geosynthetic Materials Association and the International Geosynthetics Society and IGS Foundation. He is currently the Chair of the IGS Finance Committee and an active member of the Technical Committee on Barrier Systems and the Sustainability Committee. He has a sole proprietor LLC based in Houston, Texas and consults with clients globally from France, his "covid-home". His website address is https://www.boydramseyconsulting.com/

Abstract

White Polyethylene Geomembranes have been available in the market for two decades and have been used broadly, often in demanding and sensitive applications. The performance of these materials has exceeded the initial (circa 1990's) exceptions dramatically and there is increasing evidence that the durability and lifespan of a white geomembrane in an exposed application is longer, not only than projections, but longer than that of traditional black colored geomembranes of comparable composition. Data and evidence from forensic evaluations as well as laboratory testing for durability is presented and new estimates on lifespan are given.

ORAL ABSTRACTS

Thursday 2.20pm

Laboratory Analysis of Durable Geocomposites for Exposure to Elevated Temperatures and Concentrated Brines

Hackney R[1]

[1]Geofabrics Australasia Pty Ltd

Biography

Ryan has a Bachelors degree in Geological Sciences, a Masters in Engineering Geology and is the Technical and R&D Laboratory Manager at the Geofabrics Centre for Geosynthetic Research Innovation and Development (GRID). He has 14 years of international experience specialising in physical, mechanical, hydraulic and durability testing, research and analysis of all geosynthetic materials. Ryan is the Secretary for the Australasian Chapter of the International Geosynthetics Society.

Abstract

Due to the growing specification and use of geocomposites in more challenging environments such as mine sites, geocomposite material properties beyond the standard GRI GC4 specification need to be established and understood. Research and analysis is well documented for high performance geomembranes, but there is a knowledge gap for high performance geocomposites.

High performance geocomposites can be distinguished by a resin with high Stress Crack Resistance properties, in addition to elevated stabiliser and antioxidant packages to protect the polymer in aggressive environments. Specific geomembrane formulations are available on the market for exposure to extreme conditions and can be analysed using traditional geomembrane methodologies. These geomembrane techniques have increasingly been specified for the geonet component, in addition to demonstration of geonet/geocomposite durability.

Analysis of a geocomposite subject to exposure in elevated temperature brines has been undertaken and details of this will be discussed.

In order to conduct Stress Crack Resistance on the geonet, extruded sheets and moulded plaques were analysed. A difference in performance was observed between the two preparation techniques which is a result of the measured differences in crystallinity between the prepared thin sheets.

Oxidation and immersion testing highlights differences when analysing sheets compared to geonet due to the difference in surface area to volume ratio. Also, traditional oven ageing geomembrane specifications may not be applicable to geonets as each product type has specific formulations based on their respective manufacturing methods. Immersion and oxidation data can be used to predict service life based on Arrhenius type modelling with the site-specific liquids and temperatures.

Compression testing under site loads, temperatures and liquids has been undertaken to model deformation of the geonet and the data is extrapolated to calculate site specific creep reduction factors at the intended design life to determine allowable flow rates.

The test regime and analysis sets the model for future geocomposite qualification in non-standard environments, taking into account temperature, stress, time and chemistry of the site.

ORAL ABSTRACTS

Thursday 2.20pm

Subaqueous capping remediation with activated carbon geocomposite in Sydney/ Australia

Martins G[1], Niewerth S

[1]Huesker Australia

Biography

Gus was awarded a Bachelor of Civil Engineering in 2012. Starting working in highway and road infrastructure, he had exposure to geosynthetics early in his career and has since gained valuable insight into their varied uses.

Gus has since focused on construction management and department level supervision of large geotechnical engineering projects throughout Brazil before moving to Australia in 2017.

He now lives in Melbourne and joined HUESKER to develop broader industry knowledge in the Hydraulic and Environmental aspects of geosynthetic usage in Australian construction projects.

Abstract

At Kendall Bay in Sydney/Australia, the New South Wales Environment Protection Authority (NSW-EPA) issued a remediation declaration for a significantly contaminated area adjacent to a former gasworks facility. Today, the disused industrial site has become a modern residential neighbourhood. Therefore, not only the area on land was redeveloped, but also the sediments in the bay.

It was determined by the NSW-EPA that remediation of the water body was required where the sediments contain total polyaromatic hydrocarbon (PAH) concentrations greater than 25 mg/kg on average and more than 60 mg/kg on maximum. For Total Recoverable Hydrocarbon (TRH) concentrations remediation was required where the contamination exceed an average of more than 4000 mg/kg and more than 5500 mg/kg on maximum.

The high concentration of contaminants in the sediments and the challenges associated with remediating riverbeds required an innovative solution never tried before in Australia.

To remediate the sediments a subaqueous cap with an active geocomposite was built. Materials that adsorb the organic pollutants were installed over the contaminated sediments. Percolation of the pollutants with the groundwater into surface waters is thus prevented. Furthermore, the odour of the organic contaminants is bound. With only using small amounts of activated carbon a horizontal active barrier was designed to ensure adsorption of the organic compounds over several decades. The selected material for the remediation was a geocomposite with 3,400 g/m² of activated carbon to guarantee the isolation of the sediments, protecting the environment against the contaminants.

To prepare the waterbed for the sediment capping with the active geocomposite, larger debris and other materials that could damage the geotextile filter were removed.

The geocomposite was attached to the shoreline and was unrolled of a barge assisted by divers. A steel frame was used to sink the material, ensuring controlled ballasting for mechanical protection.

The full-scale remediation works were successfully completed between Sept 2019 and October 2020.

With many industrial factories located in water-bodies surroundings, subaqueous sediment capping is a successful technical solution to reduce the impact on the local community by treating underwater contaminants in place.

Sediment capping provides several advantages when compared to dredging or other typical solutions. It is less energy-intensive and does not require dewatering and disposal of contaminated soil. It reduces exposure and related risks, minimizing disruptions to the community and impacts to the environment. In Kendall Bay, it was shown that the installation process can be done fast. This remedial option can be used in almost any situation, including several aquatic environments, e.g. rivers, harbours, lakes wetlands, etc.

The conference paper and presentation will cover the key aspects of designing and constructing a sediment cap with reactive geocomposites. Examples of sediment remediation projects from the U.S. and Australia are used to introduce the concept of horizontal reactive permeable barriers in the marine environment.

POSTER ABSTRACTS

POSTER LISTING

#	AUTHOR	AFFILIATION	POSTER TITLE
1	Peter Atchison	*PageoConsulting Ltd*	**Gas resistant membranes, where civil engineering meets construction**
2	Jeroen Berends	*Geoinventions Consulting Services Pty Ltd*	**Case study of performance-based design geogrid reinforced mine rom wall**
5	Rajesh Bhavsar	*Geofabrics Australasia Pty Ltd*	**Cost optimised solutions for unsealed access roads using geosynthetics**
4	Eric Ewe	*Geofabrics Australasia*	**Reinforced soil embankment for shallow landslide protection**
5	Mohammad Adnan Farooq	*University of Technology Sydney*	**Application of tyre derived aggregates in railway tracks**
6	Ryan Hackney	*Geofabrics Australasia Pty Ltd*	**Bituminous geomembranes in australian conditions**
7	Colin Lim	*Naue Asia*	**Geogrids used as subgrade stabilisation – experiences from large- scale field trials**
8	Gus Martins	*Huesker Australia*	**Passive soil decontamination by landscaping with permeable geotextile contaminant barriers**
9	Gus Martins	*Huesker Australia*	**Geosynthetic concrete mattress for hydraulic applications**
10	Gus Martins	*Huesker Australia*	**Passive treatment of acid mine drainage (amd) with active geocomposites**
11	Boyd Ramsey	*Boyd Ramsey Consulting LLC*	**Sustainability in the geosynthetics industry: how are we doing – a progress report**
12	Mohit Saily	*Griffith University*	**Effect of geosynthetics on swell characteristics of expansive soil in large scale column tests**
13	Harini Senadheera	*Monash University/SPARC Hub*	**A novel graphene-based geotextile for use in pavement applications**
14	Amir Shahkolahi	*Global Synthetics*	**Behaviour of geosynthetics when used for subgrade and base stabilization based on large scale laboratory and fullscale field tests**
15	Amir Shahkolahi	*Global Synthetics*	**Engineered earth armoring solutions for erosion control and surficial stability: a sustainable alternative to hard armoring**
16	Jonathan Shamrock	*Tonkin & Taylor Ltd*	**Cuspated sheet geocomposite drain as an alternative landfill capping barrier layer**
17	Michael Sorensen	*Cirtex Industries*	**Design and construction of "true" load bearing mse bridge abutments, a case study**
18	Jong Hao Su	*Solmax Geosynthetics Sdn. Bhd.*	**A review on different types of geosynthetics drainage composites**
19	Andy Warwick	*Global Synthetics*	**The environmental benefits of high performance turf reinforcement mats**

POSTER ABSTRACTS

Poster #1

Gas resistant membranes, Where civil engineering meets construction

Atchison P[1]

[1]PageoConsulting Ltd

Biography

Peter Atchison BSc. (eng) FCABE

A professionally qualified engineer, Peter was Educated in the Northeast of England at the Royal Grammar School Newcastle upon Tyne & completed his degree qualification in the Midlands in 1981

He has a career spanning 4 decades in geosynthetic materials design, manufacture installation and engineering consultancy, with over 30 years in the area of Ground gas protection.

A member of British Standards committee B553 for nearly 30 years Peter also represents the UK on CEN committee TC 189 WG6 and is the Chair of International Standards Committee ISO TC 221 geosynthetics.

Involved in the area of Ground Gas management from its initial inception in the 1990's having input to early documents such as CIRIA 149 & BRE 414, Peter was on the selection committee and steering Group for CIRIA C665 (C659) before chairing the technical committee that produced BS 8485 in 2007. Sitting on the review panels in 2015 and 2019 he has been integrally involved with the development of design standards in gas protection.

With a wider remit, Peter also sat on the steering committees of CIRIA C716 (VOC remediation) CIRIA C735 (testing and verification of installed gas protection systems) CIRIA C748 (guidance on the use of Plastic membranes as VOC barriers) CIRIA C795 retrofitting HGG protection measures in existing buildings) & CIRIA C801 (site management guide)

Peter lectures extensively on the subject both in the UK and internationally and offers support to Contaminated land auditors in Australia.

A fellow of the Chartered Association of Building Engineers Peter remains at the forefront of design solutions in the sector. He is also an ex-chairman (current treasurer) of the Radon Council, current chairman of the Environmental Industries commission (eic) Contaminated land working group and represents the British Geomembrane Association (BGA) on "Build UK".

Abstract

The use of specialist gas resistant membranes in the construction sector, for protection of construction built on previously used (brownfield) sites, commenced in the early 1990's. Originally used in Scandinavia and extensively in the UK from the md 1990's, a whole genus of materials has been developed and continues to do so. Why though, has this sector of what is essentially a construction membrane product, grown almost exclusively out of the more traditional civil engineering geomembrane sector? This presentation will explain the background; how the sector came to be thought of as a specialized part of the geomembrane sector, how the materials development and specialist installation have gone hand in hand and will show some of the challenges as well as how they have been overcome.

Initially introduced as part of a discussion presentation at Geo-Barriers 2020 in Barcelona, this presentation will develop the themes and explain how these solutions are being extended into other geographical areas (particularly Australia / NZ). It will also bring the subject up to date by explaining the current development as well as some of the trying challenges still being overcome in the sector.

POSTER ABSTRACTS

Poster #2

Case Study of Performance-Based Design Geogrid Reinforced Mine Rom Wall

Berends J[1], Kok B[1]

[1]Geoinventions Consulting Services Pty Ltd

Biography

Jeroen Berends is a Fellow Chartered Geotechnical Engineer with 22 years of experience in design and construction. He has provided optimized geotechnical designs on many large-scale projects encompassing the fields of civil infrastructure and mining in Australia and Africa. His interest and areas of expertise range from slope stability design, retaining structures, reinforced soil structures, and slope stabilisation. He is also an accredited slope assessor which allows him to undertake risk assessments for the Department of Transport and Main Roads (DTMR) and Roads and Maritime Services (RMS). During his spare time, Jeroen assists many Universities with research studies where design methods may be improved based on using practical field monitoring data and experience. Due to his extensive knowledge in geosynthetics, he has assisted DTMR with compiling two specifications for geosynthetics in road pavements.

Abstract

A large vertical gabion reinforced soil structure to a height of 15.5m was required to provide access to a new eccentric roll crusher for a mine site in Australia. To ensure construction cost-effectiveness, all reinforced fill material behind the wall and gabion rock was sourced locally from stockpiles at the mine and tested. To accommodate the high design loads induced by a fully loaded CAT992k wheel loader, the wall was reinforced with high-strength geogrid. This paper discusses the advantages of performance-based design process from site investigation, field testing, safety-in-design, construction, and instrumentation monitoring of the project. An early warning system with an emergency response plan was developed to monitor the performance of the wall as a risk mitigation exercise throughout the life span of the structure from construction stage through its design life. The performance-based design approach provides a fit-for-purpose solution to effectively control the CAPEX-OPEX cycle of the structure as a trial to future eccentric roll crusher structures for the project.

Poster #3

Cost optimised solutions for unsealed access roads using geosynthetics

Bhavsar R[1], Ali A[2]

[1]Geofabrics Aus, [2]Geofabrics Aus

Biography

Rajesh Bhavsar is leading the Team of Business Development - Infrastructure sector for Geofabrics AUS. Rajesh holds a Bachelor of Engineering degree in Civil Engineering. He has 29 years of design and construction experience, with 14+ years in sales, and Technical marketing of Geosynthetic materials in Australia. During his Fourteen years of tenure at Geofabrics he has been extensively involved in assisting Geotechnical consultancies throughout AUS and Tender negotiation with contractors for supply contracts of different Geosynthetic products. He is currently a professional member of ENG AUS, member of AGS (Australian Geomechanics Society) and ACIGS (Australian Chapter of International Geosynthetics Society).

Abstract

The production of renewable energy has almost tripled in the last decade. Nearly 30% of Australian energy is renewable and that is expected to reach 50% soon. Wind farms and solar farms are major contributors towards renewable energy. Constructing access roads and hardstand areas for windfarms, solar farms and other renewable energy sources are governing the initial construction cost of the project. The access roads not only have to provide safe access to the construction/maintenance traffic but also allow for movement of extremely heavy plants having gross weight of several hundred tons. In majority of the cases, these projects are situated on remote farming properties with poor ground conditions, environmental restrictions and having minimum infrastructure to access the site. The length of the access roads could easily run into several kilometers for a typical windfarm project due to the complex site topography. Furthermore, several hardstand areas are required for installing heavy turbines within a project site.

Geofabrics Australasia has been involved in numerous renewable energy projects utilising different

POSTER ABSTRACTS

geosynthetic solutions, offering reduction in pavement thickness, improvement in load carrying capacity by utilising locally available fill and reduction in construction time due to quick installation times compared with conventional ground improvement techniques. It also allows for using lower grade fill material and/or site won fill material without compromising the design life and thereby reducing the need for importing high quality granular material from distant quarries.

In this presentation, we will explore local case studies where geosynthetic solutions have been successfully used to achieve cost reduction without compromising on safety of the access roads and hardstands for renewable energy projects.

Poster #4

Reinforced soil embankment for shallow landslide protection

Ewe E[1]

[1]Geofabrics Australasia

Biography

Eric Ewe is a civil/geotechnical engineer with more than 20 years of experience. His experience includes designing reinforced soil slopes and walls, slope rehabilitation works, slope stability analysis, embankment over soft ground, pavement stabilisation and rockfall protection structures. One of his assignment consists of being part of the panel for the "MBIE Rockfall Protection Structures Design Considerations Guideline". Since 2006, Eric joined Geofabrics New Zealand (formerly Maccaferri NZ) forming part of the member of the technical team.

Abstract

Reinforced soil structures are well known for their versatility in adapting to difficult terrain in terms of construction. Their performances in resisting seismic loading is also well documented and evidenced from a number of earthquake around the world. The superior performance over rigid structures is due to the very ductile behaviour of the structures as a result of relatively closely spaced soil reinforcement inclusions in soil, creating a composite soil block behavior.

The application of a back to back reinforced soil structure to intercept and divert a shallow landslide is not as common. Several of these reinforced soil bunds have been designed and constructed in Christchurch following the 2011–12 earthquake and in Kaikoura after the 2016 earthquake.

This paper details case study of one of these structures in Christchurch in the south island of New Zealand, the design considerations resisting a dynamic impact pressure in the event of a shallow landslide.

POSTER ABSTRACTS

Poster #5

Application of Tyre Derived Aggregates in Railway Tracks

Farooq M[1], Nimbalkar S[1]

[1]University Of Technology Sydney

Biography

Mohammad Adnan Farooq is a PhD student in the School of Civil and Environmental Engineering at the University of Technology Sydney. Adnan has more than seven years of industry experience related to the design, construction and maintenance of roads, construction of structures in Jammu and Kashmir, India. His educational qualifications include Bachelor of Technology in Civil Engineering and Master of Technology in Transportation Engineering and Planning (TEP) from the National Institute of Technology Srinagar, India, and Master of Business Administration in Operations Management from IGNOU India. Adnan was awarded a gold medal for his exceptional performance during his Master's degree in TEP.

Abstract

In Australia, over 50 million tyres are discarded each year. These scrap tyres are used to produce Tyre Derived Aggregates (TDA), which can be used as fill material, backfill material, drainage layer, vibration-damping material, among others. Majority of the past studies model TDA as an elastic material which leads to underestimating axial strain. In the present study, performance comparison of TDA in ballasted and slab tracks in terms of vertical displacement and stress distribution is shown using three-dimensional finite element modelling in ABAQUS. The use of a hyperelastic constitutive model for TDA leads to an accurate assessment of axial strains. In this study, the axial strain prediction using various hyperelastic models is shown, and the most appropriate hyperelastic constitutive model for TDA is identified. It is shown that the vertical elastic and plastic displacement values are underestimated by 43.5% and 30.4%, respectively when simulating TDA as an elastic material for a ballasted track. Likewise, for a slab track, the vertical elastic and plastic displacement values are underestimated by 59.2% and 42.4%, respectively. The influence of TDA on stress transfer in ballasted and slab tracks is also assessed (both in vertical and lateral track directions). The addition of TDA helps to reduce the vertical stress by approximately 30 and 40 kPa in a ballasted and slab track, respectively near the zone of TDA placement. The impact of train speed and axle loads is further studied. The horizontal stress in a ballasted track is influenced by train speed, while the effect is less pronounced in a slab track. Scrap rubber is more effective in lowering vertical and horizontal stress near the region of its placement for higher axle loads.

POSTER ABSTRACTS

Poster #6

Bituminous Geomembranes In Australian Conditions

Hackney R[1], Amtsberg M[2]

[1]GRID - Geofabrics Australasia Pty Ltd, [2]Amts Services

Biography

Ryan has a Bachelors degree in Geological Sciences, a Masters in Engineering Geology and is the Technical and R&D Laboratory Manager at the Geofabrics Centre for Geosynthetic Research Innovation and Development (GRID). He has 15 years of international experience specialising in physical, mechanical, hydraulic and durability testing, research and analysis of all geosynthetic materials. Ryan is the Secretary for the Australasian Chapter of the International Geosynthetics Society.

Marc has worked for Geofabrics as the containment and mining manager for 10+ years and has critical knowledge as to manufacturing inputs for Geomembranes, Geotextiles and GCLs in containment applications, developing key understanding as to the Australian regulatory environment.

Abstract

Bituminous Geomembranes (BGM) are a composite material typically consisting of modified bitumen reinforced by polyester and/or glass fibre. The BGM may also include a thin root barrier film on one surface, with the other side having a sanded surface to increase interface friction properties. Thickness of BGMs can range from 3mm to 6mm with unit weights ranging between 3kg/m² to 6kg/m².

There is a large volume of data where BGMs have been used as roofing membranes and as waterproofing liners in dams since the mid-1970s. These have demonstrated performance in exposed applications where the BGM offers waterproofing capability in high temperatures, UV and water depths acting on the liner over time.

In the current landscape, BGMs are being installed on aggressive subgrades with soil covers that preclude other Geomembranes. The available projects and data for the designer is far less here, and most testing carried out has occurred using site trials or traditional HDPE tests at controlled laboratory temperatures of 21°C. A testing program has be established to understand how Bituminous Geomembranes function in direct contact with Australian site soils and temperatures, evaluate the suitability of traditional HDPE Geomembrane tests and/or establish specific tests for this type of design analysis.

The idea that BGMs are unaffected by site temperatures is only demonstrated for waterproofing applications where there is no soil (stress) applied. Findings indicate that when laying on angular subgrades and applying certain cover soils, a BGM at elevated temperature may be susceptible to surface damage and a reduction in shear performance will occur depending on the nature of the soil. An ambient temperature of 28°C will cause a BGM temperature increase in excess of 60°C changing the physical properties of the modified bitumen, highlighting the gap between laboratory environmentally controlled testing and site-specific temperatures. In addition, each site soil presents different risk.

Aggregate damage to BGMs on the slope vs floor must be analysed differently. Direct shear testing provides a better method to analyse BGM damage on slopes, the shearing conditions must be considered closely, but simple analysis of visible damage or thinning of the BGM is insufficient and must be followed by long term hydraulic testing.

The pliable nature of a BGM brings a need for greater site-specific understanding, considering how the product interacts with soil at elevated temperatures and long term stresses. For BGMs more than other Geomembranes, the shear properties and damage factors change depending on the subgrade type, angular material in cover soils and installation temperatures.

POSTER ABSTRACTS

Poster #7

Geogrids used as subgrade stabilisation – Experiences from large- scale field trials

Lim C[4], Klompmaker J[1], Vollmert L[2], Shahkolahi A[3]

[1]Naue GmbH & Co. KG, [2]BBG Bauberatung Geokunststoffe GmbH & Co. KG, [3]Global Synthetics Pty Ltd, [4]Naue Asia

Biography

Jörg Klompmaker is a German qualified civil engineer specializing in geosynthetic reinforced soil structures, pavement engineering and waste management design issues. Since 1996 Jörg has worked with the German geosynthetic manufacturer Lückenhaus Technical Textiles, where he was involved in the development of geosynthetic use in soil and asphalt reinforcement applications, mainly in North America and Asia.

In the year 2000 Jörg was employed by the German geosynthetic consultancy BBG Bauberatung Geokunststoffe (daughter company of geosynthetic manufacturer NAUE) where he worked as Senior Technical Consultant engaged in Road and Railway Engineering, Reinforced Earth Structures as well as Landfill and Hydraulic Engineering. Since 2005 Jörg works as the responsible product manager for NAUE's Stabilisation and Reinforcement product range Secugrid® & Combigrid®. SInce 2005 Jörg is working as product manager for NAUE's geogrid and geocomposite reinforcement product range.

Jörg has either written or co-authored some 100 technical publications that have been presented at technical conferences and seminars throughout the world. Jörg is a member of a number of Technical Committees that include Technical Committee 210 – Dams and Embankments, International Society for Soil Mechanics and Foundation Engineering (ISSMGE), Working Committee AK 6.4 "Landfill Technology" – German Association for Geotechnics (DGGT), Technical Committee on Stabilization (TC-S), International Geosynthetic Society (IGS).

Abstract

To examine the efficiency of geosynthetic reinforcement materials used as subgrade stabilization and/or base/sub-base reinforcement in road construction applications, several large-scale field trials were carried out internationally over the last few years, to simulate preferably realistic site conditions. The main aim of these field trials is to quantify the increase in road service life, which can be expected as a result of the benefit provided by the geosynthetic reinforcement.

In 2012 full-scale field test sections were carried out by Montana State University (MSU) and the Western Transportation Institute (WTI), Montana, in cooperation with the U.S. Department of Transportation (DOT) and the Federal Highway Administration. The design and layout of the test sections focused on creating a uniform roadway to study the effects of geosynthetic stabilization, subgrade strength, and base course gravel depth. This required removing the existing roadway and replacing it with a new road that was carefully constructed to minimize or control differences in site characteristics along its length. This research project was specifically planned to quantify differences in performance of various geosynthetic products under the same conditions (i.e., same subgrade strength and base course thickness). In addition, control sections without any reinforcement were constructed to study the effect that variations in subgrade strength and base course thickness had on the performance.

Similar to the trials carried out in the US, trafficking trial sections over soft subgrade were constructed and monitored in Germany (Todtglüsingen I and II) in 2013/14. The sections were constructed in a former sand pit, where a soft subgrade was artificially created by excavating the in-situ sand and replacing it with soft clay. A base course layer was installed on top of different geosynthetic products, which were placed directly over the soft subgrade. All test sections were intentionally constructed with thin base course layers to be able to quantify the serviceability of all sections with a reasonable amount of traffic passes using a 3-axle dump truck.

In both field trials extensive monitoring was carried out to allow quantifying relative surface deformation on top of the base course aggregate, which was further used to be correlated to the performance of the used geosynthetic products in the individual test sections.

The paper will discuss the design, construction, monitoring and analysis of the full-scale field test sections and the approach to extract geosynthetic performance parameters which correlated well with the performance seen in the field.

POSTER ABSTRACTS

Poster #8

Passive soil decontamination by landscaping with permeable geotextile contaminant barriers

Martins G[1], Niewerth S[2]

[1]Huesker Australia, [2]HUESKER Synthetic GmbH

Biography

Gus was awarded a Bachelor of Civil Engineering in 2012. Starting working in highway and road infrastructure, he had exposure to geosynthetics early in his career and has since gained valuable insight into their varied uses.

Gus has since focused on construction management and department level supervision of large geotechnical engineering projects throughout Brazil before moving to Australia in 2017.

He now lives in Melbourne and joined HUESKER to develop broader industry knowledge in the Hydraulic and Environmental aspects of geosynthetic usage in Australian construction projects.

Abstract

The removal of per- and polyfluoroalkyl substances (PFAS) from our environment is becoming one of the major environmental challenges facing landowners, environmental protection agencies and consultancies worldwide. Owners of a contaminated estate who want to reuse the site face the question of how to handle the excavated soil. Once the soil has been excavated, it is no longer subject to soil protection regulations but in many countries, it is subject to waste legislation. Therefore, large quantities of soils must be deposited. However, landfilling the soil is very expensive as appropriate leachate treatments are required, and regulatory uncertainties increase costs. In addition, the soil must be transported by trucks over long distances. Consequently, the reuse of PFAS contaminated sites with large amounts of excavated soil makes remediation projects very expensive and therefore unattractive. Due to this, new approaches for on-site storage in conjunction with the treatment of excavated soils must be found. An innovative approach is the use of permeable geotextile contaminant barriers placed underneath the refilled soil. The concept eliminates the need for a surface seal and allows rainwater to enter the soil body. The solubility of the contaminants is used to achieve passive soil washing. With the help of natural (or artificial) precipitation, pore water leaching takes place over time to release the chemicals from the soil particles. The leachate transports the chemicals to the permeable filter mat. Here, the contaminants are removed from the pore water before it continues to percolate unimpeded into the subsurface. In many cases, the mechanical properties of the contaminated soil make it well suited as a construction material for landscaping structures, such as noise barriers or infrastructure dams. However, to allow the use of PFAS contaminated soils in landscaping, the risk of contaminants seeping into the subsurface must be eliminated. In addition, the long-term binding of the pollutants to the filter medium must be proven and ensured. A new geotextile contaminant barrier developed by HUESKER uses a strong selective anion exchanger that has four major advantages over other adsorbents:

1) Very fast reaction kinetic that makes it possible to filter the water during percolation in such a way that the pollutant loading is below the negligibility thresholds.
2) Long and short-chain PFAS bind to the anion exchanger.
3) The binding not only takes place by adsorption but also by ion exchange. This mechanism is irreversible, and desorption virtually doesn't happen.
4) The capacity is several orders of magnitude higher than that of activated carbon.

The authors have test reports from independent laboratories on all the statements bullets. The success of the laboratory tests is to be repeated in an on-site pilot project on the site of a German airport. A test area was built in October 2021. The water passing through the soil and the filter mat is collected and analyzed at regular intervals. The pilot test is intended to demonstrate the effectiveness of the permeable barriers in the field and to allow contaminated soils to be safely stored on site.

POSTER ABSTRACTS

Poster #9

Geosynthetic concrete mattress for hydraulic applications

Martins G[2], **Cheah C[1]**

[1]HUESKER Synthetic GmbH, [2]HUESKER Australia

Biography

Gus was awarded a Bachelor of Civil Engineering in 2012. Starting working in highway and road infrastructure, he had exposure to geosynthetics early in his career and has since gained valuable insight into their varied uses.

Gus has since focused on construction management and department level supervision of large geotechnical engineering projects throughout Brazil before moving to Australia in 2017.

He now lives in Melbourne and joined HUESKER to develop broader industry knowledge in the Hydraulic and Environmental aspects of geosynthetic usage in Australian construction projects.

Abstract

Geotextile concrete mattresses have been regularly used for various hydraulic applications and demonstrated successful erosion protection and sealing functions to projects for some 60 years providing a good understanding of performance. These include canal/channel linings, pipeline covers, slope revetment, scour and berth protection and pond lining. The geotextile concrete mattress system provides durable protection of concrete, reducing installation duration and simplifying logistics required in comparison to other conventional concrete solutions. Through custom fabrication, the mattresses can be made to accommodate complex geometries. Moreover, the system is able to be installed underwater and on steep slopes. The technology and benefits of the geotextile concrete mattress system will be outlined along with executed projects around the world.

Poster #10

Passive Treatment of Acid Mine Drainage (AMD) with Active Geocomposites

Martins G[1], Niewerth S[2]

[1]HUESKER Australia, [2]HUESKER Synthetic GmbH

Biography

Gus was awarded a Bachelor of Civil Engineering in 2012. Starting working in highway and road infrastructure, he had exposure to geosynthetics early in his career and has since gained valuable insight into their varied uses.

Gus has since focused on construction management and department level supervision of large geotechnical engineering projects throughout Brazil before moving to Australia in 2017.

He now lives in Melbourne and joined HUESKER to develop broader industry knowledge in the Hydraulic and Environmental aspects of geosynthetic usage in Australian construction projects.

Abstract

Mining of finite resources inevitably leaves open pits and shafts after the mines are closed. Ideally, natural rehabilitation takes place and the surrounding environment is re-established. However, the environment and the surface water still need to be protected. Rainfall corrodes rock and leaches metals and metalloids, such as aluminium, copper, iron or nickel into surface water. Interacting with high acidity, these substances pose an environmental risk to plants and animals. Vertical flow ponds or channels are a passive approach to mine water remediation. Surface drainage water is diverted to these retention ponds. In "conventional" vertical flow ponds, metal-contaminated water percolates through a thick layer of limestone rock. This neutralizes the pH and removes iron without the use of energy or costly technologies. Depending on the metal concentration and type, as well as pH, a variety of rock types are used to neutralize acid and precipitate metals. Such acid mine drainage retention ponds were built using a1 m thick limestone layers (Hedin, 2020). Other ponds were built using thick layers of gravel plus amendments.

POSTER ABSTRACTS

HUESKER works together with an international consultancy to create a vertical flow pond covered with an active geocomposite for an abandoned nickel mine in Finland. In the design, a thin layer of highly active cation adsorbent replaces the thick layer of limestone or gravel. The granular adsorbent is mechanically stabilized and fixed between two layers of geotextile and can therefore be installed with a constant layer thickness. Due to the large surface area of the adsorbent, the thin layer of the active geocomposite has higher efficiency for water treatment than a thick layer of stone. The simplified installation process of the geocomposite speeds up construction time for large scale filter ponds. In August 2021, a pilot field was built in Finland to prove the application's long-term efficiency. Once a week water samples are collected and analysed in the laboratory. The samples from the first three months show a reduction of nickel by an average of 65 % and copper as well as aluminium by an average of more than 90%. In addition, the reduction of other metals and the pH value are documented. This presentation introduces the concept of vertical flow ponds covered with active geocomposites and discusses all findings from the pilot plant in Finland.

Poster #11

Sustainability in the Geosynthetics Industry: How are we doing - a progress report

Ramsey B[1]

[1]Boyd Ramsey Consulting LLC

Biography

Boyd Ramsey has been deeply involved in the geosynthetic industry for over three decades. He has held many leadership positions with the Geosynthetic Institute, the Geosynthetic Materials Association and the International Geosynthetics Society and IGS Foundation. He is currently the Chair of the IGS Finance Committee and an active member of the Technical Committee on Barrier Systems and the Sustainability Committee. He has a sole proprietor LLC based in Houston, Texas and consults with clients globally from France, his "covid-home". His website address is https://www.boydramseyconsulting.com/

Abstract

Sustainability, as well as a current topic, is perhaps the most important initiative of the human race. It is not possible to have infinite growth with the finite resources of our planet and humans need to move from the linear model of consumption and disposal to a sustainable more circular economy – the geosynthetic industry is a part of this. This paper will review the positive contributions that geosynthetics make to a sustainable environment, how our businesses and facilities are operating from a policy perspective and how geosynthetics can and should be a part of upcoming changes to the plastics and recycling industries. The author has been active within our industry organizations on this topic, but presents his own views and opinions.

POSTER ABSTRACTS

Poster #12

Effect of geosynthetics on swell characteristics of expansive soil in large scale column tests

Saily M[1], Gratchev I[2], Gibbs D[3]

[1]Griffith University, [2]Griffith University, [3]Geofabrics Australasia Pty Ltd (Gold Coast)

Biography

PhD candidate at Griffith University

Abstract

Expansive soils are common in Australia, and they cause significant economical damage to infrastructure during rainfall. It is expected that due to climate change and more frequent and sever rainfall events, the damage caused by expansive soils could further increase. This paper seeks to investigate the impact of geosynthetics on swelling behaviour of expansive soil as a feasible way to deal with this natural hazard. A series of large-scale column experiments were conducted using a 100x30x30 cm rectangular soil column. A range of sensors were placed in the soil mass to accurately measure the changes in pore water pressure, suction, water content, and vertical displacements over time. High plasticity soil from Toowoomba, QLD was compacted to a pre-determined dry density and water content into the column. Vertical displacements were measured at different depths to better understand the swelling mechanism and factors affecting it.

A real-life rainfall event that occurred in Toowoomba in 2011 was simulated under the laboratory conditions to investigate the swelling behaviour of the soil. During this test, the greatest amount of swell was observed in the top part of the soil mass. It was also found that swell initiated when the water content greatly increased, a process that was dominated in the top part of the soil mass. To understand the effect of geosynthetics on the performance of expansive soil, a layer of geotextile combined with geogrid was placed in the top part of the soil column.

It was observed that introducing geosynthetics changed the moisture front development which provided better moisture distribution across the soil mass. The experimental data indicated that overall swell of the top part of soil mass was reduced by about 30% despite the fact that the final water content of the soil mass was very similar compared to the test without the geosynthetics. This paper presents the obtained results and discusses the possible uses of geosynthetics materials to mitigate the damage cause by expansive soils.

POSTER ABSTRACTS

Poster #13

A novel graphene-based geotextile for use in pavement applications

Senadheera H[1], Bouazza A[1], Kodikara J[1], Gibbs D[2]

[1]Monash University/SPARC Hub, [2]Technical, Research and Innovation, Geofabrics Centre for Geosynthetic Research, Innovation & Development

Biography

Harini Senadheera is a second-year PhD student at the Department of Civil Engineering at Monash University, affiliated to SPARC Hub (Smart Pavements Hub, Australia).

Abstract

Monitoring pavement mechanical, hydro and thermal loading is crucial in pavement reliability modelling and maintenance operations. Different types of pavement instrumentation such as strain gauges, deflectometers, thermocouples, moisture sensors and pressure cells are used for in-situ pavement evaluation under vehicle and environmental loading. Additionally, monitoring mechanical loading is also important for effective traffic management and to prevent fatigue damage by controlling increased distress caused by vehicle overloading. Pneumatic tubes, inductive loops and Weigh-in-Motion systems are few of such methods of executing traffic volume, vehicle and speed surveys. However, most of these existing techniques have several limitations, in terms of providing only discrete partial information, being destructive to the pavement being monitored and incurring high installation and maintenance costs. Therefore, there is still a deficiency in a monitoring method that enable spatially continuous and complete information capabilities. In the current project, a novel graphene-based geotextile is evaluated for use in road infrastructure. Geotextiles are widely used and serve various purposes including separation, filtration and drainage in geotechnical engineering applications. Graphene, one of the most conductive materials on earth, is coated on one side of the geotextile to produce a conductive geotextile attributing multi-functional properties to the said geotextile. Being used for leak detection in waste, containment and landfill applications, the current project will extend its use to applications involving mechanical, hydro and thermal loading with special focus on its potential as a spatially continuous sensor to detect response and damage in pavement layers. In this study, various tests were carried out to characterize the electrical response of the material in terms of mechanical loading. The results showed a notable electro-mechanical behaviour in the geotextile and proved the versatility of the material for use in a vast range of pavement applications. It is expected that the outcomes of this research will benefit significantly for smart road construction, in the context of pavement assessment and vehicle management using novel sensing materials.

POSTER ABSTRACTS

Poster #14

Behaviour of geosynthetics when used for subgrade and base stabilization based on large scale laboratory and full-scale field tests

Shahkolahi A[1]

[1]Global Synthetics

Biography

Amir has a Bachelor's and Master's degree in Civil and Environmental Engineering and fellow member of Engineers Australia. As a designer, project manager and researcher, he has been involved in civil and geosynthetic industry over the last 20 years. He is the National Technical Manager at Global Synthetics. Amir is currently the chair of the Australian Geomechanics Society (AGS)-QLD Chapter, board member of the American Society of Civil Engineers (ASCE)-Australian Section, Industry Board member of the Australian Pavement Research Hub, Board member of ARC Training Centre for Advanced Technologies in rail Track Infrastructure (ITTC- Rail), member of the Standards Australia Technical Committee CE/032-Reinforced fill structures working group, and member of the ASTM Technical Committee D35-Geosynthetics. He is also a board member of the International Geosynthetic Society Technical Committees for Barriers (TC-B), board member of the QLD Landfill Working Group, board member of the Waste Management and Resource Recovery of Australia in QLD, member of the International Geosynthetic Society Technical Committees for reinforcement (TC-R) and Stabilisation (TC-S), university guest lecturer on geosynthetics, part time PHD researcher, and the industry supervisor and advisor for several geosynthetic and geotechnical research projects in Australia and overseas.

Abstract

Geosynthetic provides a wide range of benefits including reduction in the pavement thickness, improvement in the pavement serviceability and design life/design traffic, providing a working platform to start the construction and many more. These benefits have been proven though various studies on the behaviour of geosynthetics reinforced/stabilised roads over the last 40 years. Geogrid properties, soil-geogrid interaction, the thickness of the soil, the soil type and the durability properties of a geogrid greatly influence the design and expected service life in a road construction. Many publications have focused on the performance of the whole pavement system. This paper is more focused on the behaviour of the geosynthetics itself and presents test results from local and international research works including field tests and long term instrumented field monitoring, large scale laboratory tests, and numerical modelling carried out to investigate the behaviour of geogrids used in roads as well as the long-term efficiency of geosynthetics.

POSTER ABSTRACTS

Poster #15

Engineered Earth Armoring Solutions for erosion control and surficial stability: A sustainable alternative to hard armoring

Shahkolahi A[1]

[1]Global Synthetics

Biography

Amir has a Bachelor's and Master's degree in Civil and Environmental Engineering and fellow member of Engineers Australia. As a designer, project manager and researcher, he has been involved in civil and geosynthetic industry over the last 20 years. He is the National Technical Manager at Global Synthetics. Amir is currently the chair of the Australian Geomechanics Society (AGS)-QLD Chapter, board member of the American Society of Civil Engineers (ASCE)-Australian Section, Industry Board member of the Australian Pavement Research Hub, Board member of ARC Training Centre for Advanced Technologies in rail Track Infrastructure (ITTC- Rail), member of the Standards Australia Technical Committee CE/032-Reinforced fill structures working group, and member of the ASTM Technical Committee D35-Geosynthetics. He is also a board member of the International Geosynthetic Society Technical Committees for Barriers (TC-B), board member of the QLD Landfill Working Group, board member of the Waste Management and Resource Recovery of Australia in QLD, member of the International Geosynthetic Society Technical Committees for reinforcement (TC-R) and Stabilisation (TC-S), university guest lecturer on geosynthetics, part time PHD researcher, and the industry supervisor and advisor for several geosynthetic and geotechnical research projects in Australia and overseas.

Abstract

Sustainability and resiliency are becoming more important in project design, with emphasis being placed on the environmental impact. Slope stability solutions should be designed to provide a low environmental impact to achieve long-term performance and overall project success. During design, it's important to consider factors such as durability, economics and environmental impacts. Engineered Earth Armoring Solutions (EEAS) are recognised as the sustainable armouring and slope stability solution proving both surficial stability and erosion control at the same time. An EEAS is a component system consisting of a High Performance Turf Reinforcement Mat (HPTRM) to provide erosion protection and surficial strength, coupled with Percussion Driven Earth Anchors (PDEAs) for resistance to shallow-plane instability. The system is designed to optimise rapid vegetation growth and keep soil in place, thereby resisting mobilisation of soil masses associated with sliding failures of slopes. Key physical and material properties of the component system include optimal ultraviolet resistance, flexibility, and tensile strength of the HPTRM, along with its ability to promote vegetation establishment through increased soil and moisture retention. PDEAs can be selected in various lengths and strengths and are composed of corrosion-resistant material to ensure longevity while maintaining ease of installation. Design methodology of the EEAS for reinforcement against relatively shallow translational sliding failures consists of an infinite slope method solution adapted for the inclusion of PDEAs. Procedures for utilising the EEAS for relatively deep-seated rotational sliding failures include the modeling of stability using conventional limit equilibrium methods. Components of the ARVS are integrated into the model using slope stability modeling software. Results include the potential for an EEAS for specific cases of reinforcement for slope stability. The sustainability of the EEAS including environmental parameters such as carbon footprint, economical and engineering aspects is analysed and compared with traditional solutions. An example of the practical application of the design methodology is demonstrated through presentation of a slope failure repair case study.

POSTER ABSTRACTS

Poster #16

Cuspated sheet geocomposite drain as an alternative landfill capping barrier layer

Shamrock J[1]

[1]Tonkin & Taylor Ltd

Biography

Jonathan is a senior civil and environmental engineer with over 25 years' experience, working exclusively in the field of solid waste engineering. Jonathan's experience encompasses design and construction supervision of general, industrial and hazardous waste landfill developments and barriers, design and construction supervision of waste facility capping barriers and stormwater management facilities, design incorporating geosynthetic materials including specifications and construction quality assurance and design and construction supervision of landfill gas extraction, conveyance and destruction systems.

Jonathan's experience up to 2017 has been in South Africa and Africa, where has been involved with numerous landfill projects until he immigrated to New Zealand in 2018. Since joining T+T Jonathan has designed landfill expansion projects on Whitford landfill, Kate Valley landfill, Omarunui landfill and Redruth landfill in New Zealand, the Naboro landfill in Fiji and undertaken reviews of landfill projects designed by T+T in Australia. He has designed landfill rehabilitation and closure projects on Kate Valley landfill, Waiouru landfill, Claris landfill and the Ngawha geothermal power generation plant sludge pond capping. He has designed landfill gas extraction system expansions for projects in New Zealand and has reviewed designs compiled by T+T in Australia

Jonathan was appointed Chairman if the International Geosynthetics Society Technical Committee on Barriers in September 2020 and Vice President of the Australasian Chapter of the International Geosynthetics Society in September 2020.

Abstract

The final capping layer of a landfill is designed to control water ingress, minimise landfill gas discharges, prevent exposure of waste and rehabilitate the site for the proposed end use. Landfill capping and closure in New Zealand is guided by the requirements in the Technical Guidelines for Disposal to Land, published August 2018. The majority of landfills capped in New Zealand use a compacted low permeability soil final cover layer although the guidelines also allow for a composite compacted clay/geomembrane final cover. The issue with a composite geosynthetic liner is that it will exclude the majority of rainwater infiltration into the landfill, thus prolonging the eventual biodegradation and stabilisation of the waste in the landfill.

If there is no source of low permeability soil for the final capping on a landfill the cost, and overall sustainability, of opening up an offsite borrow, trucking the material to the landfill, and rehabilitating the borrow area becomes a significant issue. Alternative geosynthetic materials that can be used in a final capping system are geocomposite drainage products, specifically those manufactured from cuspated HDPE sheets.

A geocomposite drain is a polyethylene single-cuspated sheet core with needle punched non-woven geotextile thermally bonded on both sides. The single-cuspated sheet forms a near impermeable barrier to infiltration with only minor seepage potential along the joints between sheets which is typically overlapped (as roof tiles). The geocomposite drain collects water seepage from precipitation infiltrating the soil cover placed over it and channels the water into seepage collector pipes that discharge the water to the surface water drainage system. The drain therefore significantly reduces infiltration to the waste by intercepting infiltrating water and discharging it to surface water, preventing it from reaching the waste body.

The geocomposite drain therefore provides a sustainable alternative to a compacted soil layer as the drain can be covered by site won soils suitable for vegetation establishment, eliminating the need to source soil from an offsite borrow area.

POSTER ABSTRACTS

Poster #17

Design and construction of "true" load bearing MSE bridge abutments, a case study

Sorensen M[1], Froggatt I[2]

[1]Cirtex Industries Pty Ltd, [2]GHD

Biography

Ian Froggatt is a Technical Director at GHD in Christchurch, New Zealand. Ian is a Chartered Professional Geotechnical Engineer who has over 30 years' experience of geotechnical design and construction work. His career has been based mainly within the commercial consulting environment. Ian is originally from the UK where he was also a Chartered Civil Engineer. He has been based in New Zealand for over 10 years and while there has specialised in seismic geotechnical design work. He has been involved in large roading and bridge projects and has developed a particular expertise in the design and construction of both MSE retaining walls and bridge abutments. The Macrae's quarry bridge abutments represent one of the largest, if not the largest, examples of "true" mechanically stabilised bridge abutments using extensible geogrids in New Zealand. Ian was the lead designer at GHD for this project and signed the related Geotechnical Producer Statement for the bridge.

Abstract

MSE technology is well established around the world with recorded examples of early structures being built over 50 years ago, and the concept commonly accepted by government departments and developers globally. However, despite the amount of research and case history there remains a hesitance in some areas to use the proven ability of MSE technology to bear the loads of bridge superstructures. In particular, there is increased hesitance to the use of "extensible" reinforcements (such as geosynthetics) relative to "inextensible" (steel) reinforcements. This hesitance has limited the number of true (non-piled) abutments constructed using extensible reinforcement.

Load bearing MSE abutments are a subset of the category of reinforced soil structures, and themselves are divided into several sub-categories based on design method and detailing. An example of this is the more recent adaption of GRS-IBS technology in North America which uses closer reinforcement spacing and a different design methodology than traditional MSE walls under design codes such as FHWA and BS8006.

There are many advantages to using MSE technology to support bridge superstructures, but the three key benefits that present themselves are speed of construction, lower cost, and better performance in areas where settlement can occur as compared with piled bridge design, as the elements can move and settle together.

We will present a case study in which the client was a mining company which was not constrained by narrow regulations which in most cases are designed to cover a plethora of cases, climates, and conditions. The load bearing abutments were 12 metres high, close to vertical at 85 degrees and the bridge was directly supported by the reinforced soil mass with a bridge seat. Designed to BS8006 and considering guidance from Transfund New Zealand Research Report 239, the abutments utilised a high strength PET geogrid and a select fill material, with a temporary facing system designed to last the lifespan of the project, but able to be simply upgraded if a longer life is required in the future.

Loadings were significant with unfactored dead loads of 500 kN per metre and unfactored live loads of 300 kN per metre. A key criterion of the design was limiting deformations both during construction and after bridge launch. Subsequent in-service deformations were minimal which further confirms the suitability of this technology.

POSTER ABSTRACTS

Poster #18

A review on different types of geosynthetics drainage composites

Su J[1], Ng H[2]

[1]Solmax Geosynthetics Sdn. Bhd., [2]Solmax Geosynthetics Co. Ltd.

Biography

Su Jong Hao graduated from Universiti Tenaga Nasional (UNITEN) with a first-class honours degree in Civil Engineering. He joined the geosynthetics industry since 2012 and has gained about 10 years of experience in the geosynthetic applications. He has experience in various design with geosynthetic materials in infrastructure, hydraulic and environmental engineering applications in the Asia-Pacific region. Mr. Su joined Solmax Geosynthetics in 2019 and has been responsible for providing technical support and development of value-added products in the region with focus in Malaysia, Vietnam & Oceania. He is also an active member of International Geosynthetics Society – Malaysia Chapter (MYIGS) and ACIGS (Australia). Mr. Su has authored and presented several papers on various geosynthetics applications in both local and international conferences.

Abstract

Geocomposite drainage products consist of a combination of open structure geonet core and geotextile heat laminated to either one side or both sides of the material. They are commonly used for in-plane liquid and/or gases conveyance with occasion added function of protection towards underlying polymeric geomembrane in environmental, hydraulic and civil applications, for example in landfill for leachate collection and leak detection, heap leach pad for solution collection, under road as capillary break and wall/slope for water drainage. There are a variety of geocomposite drainage products manufactured in different geonet core structure. This paper covers geocomposites made from geonet core with extruded HDPE strands forming a uniform structure including, biplanar, triplanar, box-shaped and T-shaped core. The types of geocomposites, area of use, performance under specific conditions will be reviewed with emphasis on the transmissivity or in-plane flow and structural properties of the geonet core. Test results show that under high overburden pressure condition, geonet core having higher intrusion resistance performs better. The shape and configuration of geonet strands has an influence on both mechanical and hydraulic performance. Recommendation on the types of geonet-geocomposite will be provided for different applications. Two case studies of geocomposites will be discussed in this paper.

POSTER ABSTRACTS

Poster #19

The Environmental Benefits of High Performance Turf Reinforcement Mats

Warwick A[1], Loizeaux D[1]

[1]Global Synthetics Pty Ltd

Biography

Andy Warwick is a National Product Manager at Global Synthetics. Andy has been working in the geosynthetic industry for over fifteen years, and spread across 5 different continents.

He has worked at several large geosynthetic companies including Geofabrics (UK), Fiberweb (Berry Global) and Polyfabrics.

Andy has extensive experience in product development and manufacturing as well as a wide understanding of the various applications, standards and local country practices involved in the geosynthetic selection process.

Andy has demonstrated an effective leadership style and is committed to sharing his knowledge of international learnings with his team, and beyond.

He has been involved in a number of associations not limited to;

UK IGS, Pakistan IGS, BSA & CEN

Abstract

With the ever changing environment, along with the harsh conditions weather events can bring, erosion control is a critical part of infrastructure developments.

Equally as the world moves forward with its zero emissions targets, the way we make constructure and sustain is becoming increasing critical.

Today we look at the various erosion control options such as hard rip-rap armour and using plastic.

Despite common belief not all plastics are bad for the environment and providing they are used correctly can have very positive impact.

- Today we will run through the impacts of:
- Water Quality management
- Wildlife Impact
- Carbon Footprint reduction
- Engineered plastics vs single use plastics.

When selecting erosion control solutions, High Performance Turf Reinforcement Mats (HPTRMs) offer significant environmental benefits, that other methods such as hard amour rock rip rap and concrete provide.

While building up your design it is important to consider factors such as hydraulic performance, durability, economics and environmental impacts. Additionally sustainability is the increasing focus for good reasons.

HPTRMs can help improve water quality, be used in environmental sensitive areas and have a much lower impact on the environment.

THANK YOU TO OUR SPONSORS & EXHIBITORS

GOLD SPONSORS

FABTECH FLEXIBLE GEOMEMBRANE LINERS & COVERS PROTECTING THE ENVIRONMENT

GEOFABRICS® Sustainable solutions

Global Synthetics LEADERS IN GEOSYNTHETICS

HUESKER Ideas. Engineers. Innovations.

SPONSORS

ADE CONSULTING GROUP

ATARFIL® geomembranes

AXTER AUSTRALIA

GREENTEC CONSULTING

MACKENZIE ENVIRONMENTAL CIVIL AND ENVIRONMENTAL ENGINEERING

Naue

red earth engineering

Tensar®

TRI AUSTRALASIA

EXHIBITORS

acigs Australasian Chapter of the International Geosynthetics Society

allflow Systems & Solutions

CIRTEX GAIN MORE GROUND™

CONCRETE CANVAS® Concrete on a Roll

AUSTRALIAN CONCRETE MATS www.ConcreteMats.com.au

jaylon

SOLMAX

TENEO

Tiltex AUSTRALIA

OUR SPONSORS

FABTECH
FLEXIBLE GEOMEMBRANE LINERS & COVERS
PROTECTING THE ENVIRONMENT

Gold and Master Class Sponsor

Protecting the Environment – Fabtech is Australia's premier geomembrane designer and installer. Fabtech has extensive experience as a leading geomembrane installer with a National presence and International partnerships. Fabtech is a proven leader in the multi-disciplined technology that encompasses the lining and covering of dams, reservoirs, landfills, effluent lagoons, tunnels, irrigation channels and tanks. Fabtech's technical capability is supported with an international network of industry experts and global tier 1 material suppliers.

www.fabtech.com.au

GEOFABRICS®
Sustainable solutions

Gold & Keynote Speaker Sponsor

Geofabrics® has been in the business of building key infrastructure across Australasia and beyond for over 40 years. We help our clients mitigate environmental risk through world leading research and innovative product development.

We work to protect, contain and secure the physical environment using smart geotextile and geosynthetic products. Our vision is to be a solution provider, to supply products that demonstrate cost savings, superior technical performance, safer operations and better environmental outcomes.

www.geofabrics.co

OUR SPONSORS

Gold and Master Class Sponsor

Global Synthetics
LEADERS IN GEOSYNTHETICS

Global Synthetics is a leading distributor and manufacturer of a wide range of geosynthetics to service the engineering, construction and building sectors throughout Australia, New Zealand, Papua New Guinea and the South Pacific Territory. Global Synthetics is staffed by personnel with a long history in engineering design and specifically, the use of appropriate geosynthetic products to provide value engineered, technically viable solutions to construction projects.

Global Synthetics has a commitment to quality in everything we do. We partner with the world's leading manufacturers of geosynthetic products, that are technically advanced and are meticulously controlled from raw material purchase, through production and eventually warehouse and delivery to you, our client.

www.globalsynthetics.com.au

OUR SPONSORS

Gold Sponsor

HUESKER Australia provides the Australasian region direct access to 160 years of proven geosynthetics engineering, development, manufacturing, supply and installation experience. HUESKER is the only manufacturer from which woven and knitted geosynthetic reinforcement materials can be obtained directly in the Australasian region. Our highly dedicated local team refines 160 years of real-world global geosynthetics experience and apply it to local conditions, with millions of square metres of high-quality materials applied across the Australasian region successfully.

HUESKER Australia engineers project-specific solutions for our Mining, Roads & Pavements, Environmental and Hydraulic engineering applications. Incorporating global market-leading brands such as MineGrid™, Hatelit C™, Tektoseal™ and SoilTain™ providing our clients technically and commercially appropriate outcomes, consistently.

www.huesker.com.au

Keynote Speaker & Concurrent Session Sponsor

Red Earth Engineering (REE) is a leading engineering consultancy with a reputation built on understanding and exceeding clients' expectations. We provide tailored solutions and high level strategic advice in the areas of mining, mineral processing, oil and gas and infrastructure – Australia wide and internationally.

Safety and quality of service are as important to us as they are to you. We'll work with you from project conception through to construction, commissioning, operation and closure – delivering projects on time and on budget. Our skilled team of engineers, designers and scientists use the latest programs and technology to create solutions that meet safety, budget, design and quality assurance requirements.

REE can assist you in the following areas:

- Geotechnical Engineering
- Civil Engineering
- Geosynthetic Engineering
- Tailings & Water Dams
- Project Engineering
- Peer Review / Subject Matter Experts
- Construction Support and Quality Assurance

www.redearthengineering.com.au

OUR SPONSORS

Conference Dinner and Master Class Sponsor

AXTER is a world leading international manufacturer of durable reinforced waterproofing membranes.

AXTER manufactures puncture resistant COLETANCHE geomembranes for waterproofing and environmental protection. As the only 5.1 meter wide geomembrane that will not wrinkle, COLETANCHE is the No.1 waterproofing solution for civil engineering and mining structures!

www.coletanche.com

Barista Cart Sponsor

ATARFIL manufactures high performance GEOMEMBRANES (HDPE –VLDPE-LLDPE-PP) by FLAT-DIE extrusion, developed with the most advanced polymer formulations. Ongoing investment focus on both internal and industry R&D testing ensures Atarfil understands the Geomembrane that provides the highest environmental protection from high risk containments. We have production plants in Europe, Middle East and North America that use the same select resins and formulations to ensure product consistency around the world, supporting the SAFE CONTAINMENT of contaminants in 50+ countries.

www.atarfil.com

OUR SPONSORS

Delegate Satchel Sponsor

NAUE – BUILDING ON SUSTAINABLE GROUND

Naue Asia Sdn. Bhd. is an EN ISO 9001-certified company and is part of the global Naue Brand.

As one of the world's leading geosynthetic manufactures, Naue's innovative solutions are pioneering sustainable geosynthetics and their applications.

We have considerable experience in supplying premium products and services which assist engineers with solving design problems using sustainable construction practices for environmental, Hydraulic and infrastructure applications. With global product brands such as Bentofix ® X, Bentofix ®, Combigrid ®, Secugrid ® and GreenLine , Naue leads the market of patented, contemporary products for protection and enhancement of the build and natural environment.

www.naue.com

Welcome Reception Sponsor

TRI Australasia is Australia's leading NATA and GAI LAP Accredited Geosynthetic Testing laboratory covering the full range of geosynthetics.

TRI provides a unique range of geosynthetic services to engineers, regulatory bodies, material specifiers, installers and suppliers. Much more than just a testing facility TRI offers a complete service package to our clients to assist them in taking the risk out of geosynthetic applications. With over 40 years in corporate experience in design, specification, manufacturing, installation and testing of geosynthetics, our team can provide detailed assistance in virtually every aspect of your geosynthetic project.

www.tri-env.com.au

Refreshment Breaks – Days 1 and 2

Mackenzie Environmental is a specialist Geoenvironmental Engineering consultancy based in Melbourne. Mackenzie Environmental specialises in the design of geosynthetic lining systems for landfill containment systems, site rehabilitation and waste water storage/treatment systems. Additionally, Mackenzie Environmental provide specialist construction quality assurance supervision services of geosynthetic installations as well as a broad range of environmental monitoring and risk assessment services.

www.mackenzieenvironmental.com.au

WiFi and Name Badge Sponsor

ADE Consulting Group is a leading provider of Geotechnical and Environmental services with over 20 years' experience providing clients in Mining, Oil and Gas, Waste Management and Infrastructure sectors with practical solutions through the successful integration of industry experience, innovative practices and technical excellence.

We aim to not only solve geotechnical and environmental related problems, but to provide proactive, site-specific and practical recommendations, ensuring our clients meet their desired objectives in a cost-effective manner. ADE prides itself on having an experienced team of consultants who provide high quality and efficient service at highly competitive prices.

www.ade.group

OUR SPONSORS

Concurrent Session Sponsor

GreenTec Consulting provides specialist waste management, landfill engineering, environmental management and construction support services to local government and private industry in the waste and environment sectors.

www.greentecconsulting.com.au

Concurrent Session Sponsor

Tensar International is a world leader and expert in technology driven solutions for soil reinforcement and ground stabilisation. The company is a privately owned company headquartered in the USA.

Our high-performance solutions have been used in many thousands of civil engineering projects all across the globe, including road pavements, railways, working platforms, ports, housing, retail and commercial developments, mining, erosion prevention and waste industry applications.

With over 30 years of experience in developing, manufacturing, and designing innovative, sustainable construction solutions as an alternative to traditional methods, Tensar geogrid products and systems have been rigorously tested and studied by leading universities, independent laboratories and government authorities.

www.tensarinternational.com

OUR EXHIBITORS

For over 20 years, **Allflow Systems & Solutions** has provided customers with premier polymer piping systems and solutions, building relationships based on a commitment to superior quality, performance and value.

We are now recognised as market leaders in supplying systems and package solutions tailored to suit our customers' needs "on-time every time."

www.allflowsystems.com.au

Quick Unroll Erosion Control Mat

Australian Concrete Mats (ACM) is the quick and easy, cost-efficient, sustainable solution to severe and minor erosion issues. Engineered as an effective alternative to methods like rip rap or gabion mattresses, that makes stabilising slopes and protecting waterways easy. The erosion control mat has concrete shapes embedded into polypropylene geogrid, and an underlay of geotextile material to either encourage or inhibit vegetation to grow through the mat. Concrete mats are supplied in rolls, that are easy to handle and quick to install. Once laid down they start working right away, with sound and sustainable long-term benefits!

More info on the website. **www.concretemats.com.au**

Cirtex is your civil construction partner for retaining wall systems, geosynthetics solutions and earth anchoring. We are committed to making every one of your projects 100% successful. From initial concept through to advance collaboration with your project team, Cirtex has a wealth of experience and knowledge to provide proven, cost-effective solutions to Environmental, Civil and Hydraulic engineering challenges.

www.cirtex.com.au

Concrete Canvas Ltd (CCL) manufactures four award-winning products based on its core material technology. Concrete Canvas® (CC) GCCM (Geosynthetic Cementitious Composite Mat) is a flexible cement-filled geotextile that hardens on hydration to form a thin, durable and waterproof concrete layer. Applications include; channel & canal lining, erosion control and weed suppression. There is no need for mixing or measuring; the concrete is premixed and cannot be over hydrated; it will set underwater and in seawater. Essentially, it's Concrete on a Roll™.

Concrete Canvas independently tested, assessed and certified by the British Board of Agrément (BBA) with a exposed life expectancy of 120 years when used in erosion control applications. Concrete Canvas products exceed the minimum requirements of the international standard for GCCM's , ASTM D8364 – Standard Specification for Geosynthetic Cementitious Composite Mat (GCCM) Materials

www.concretecanvas.com

OUR EXHIBITORS

Solmax is a geosynthetics pioneer, innovator, and leader. With almost five decades' experience, our GSE and TenCate Geosynthetics acquisitions make us the world's largest geosynthetics manufacturer. With plants in North America, Europe, Asia, and the Middle East, our geosynthetics are used in critical applications by the biggest names in mining, petroleum, waste management, construction, agriculture and irrigation, civil engineering, hydraulic and environmental works, infrastructure, and transport. Our products safeguard the earth from waste and contaminants, and protect investments, helping preserve the integrity and longevity of vital infrastructure in the toughest environments. With expertise across all geosynthetics categories, Solmax is an innovation powerhouse. Our vision is to advance the geosynthetics industry, raising standards and creating products that are more reliable, stronger, resistant to contaminants, and accessible everywhere.

Solmax – geosynthetics that support human progress. Visit us at **www.solmax.com**.

Containment is in our name and it's what we do best. '**Teneo**', derived from Latin for containment defines our expertise and sees us as the only vertically integrated containment delivery team in Australia.

www.teneogroup.com.au.

Tiltex Australia has over 40 years experience in the geosynthetic industry.

Our exclusive Tiltex B Anti Cracking GCCM incorporates a unique Anti Cracking fibre enhancement as part of it's high strength, rapid setting cement-sand mix. These exclusive properties add durability, strength and flexibility with the ability to withstand extreme climate fluctuations. Tiltex B has 80MPa Compressive Strength & 16.1MPa Flexural Strength*.

Tiltex B Anti Cracking GCCM replaces rip rap, stone chipping, grout blankets, shotcrete, concrete, bitumen geomembrane and other traditional erosion control materials at reduced costs and a faster installation.

Our solution based upon in house engineering and design team work with client's designers, engineers and project managers to provide the best project solution possible.

www.tiltexaustralia.com.au

*After 7 days

Proudly hosted by

acigs

Australasian Chapter of the
International Geosynthetics Society

www.acigs.org

GEOANZ #1
ADVANCES IN GEOSYNTHETICS

www.geoanzconference.com.au
#advancesingeosynthetics