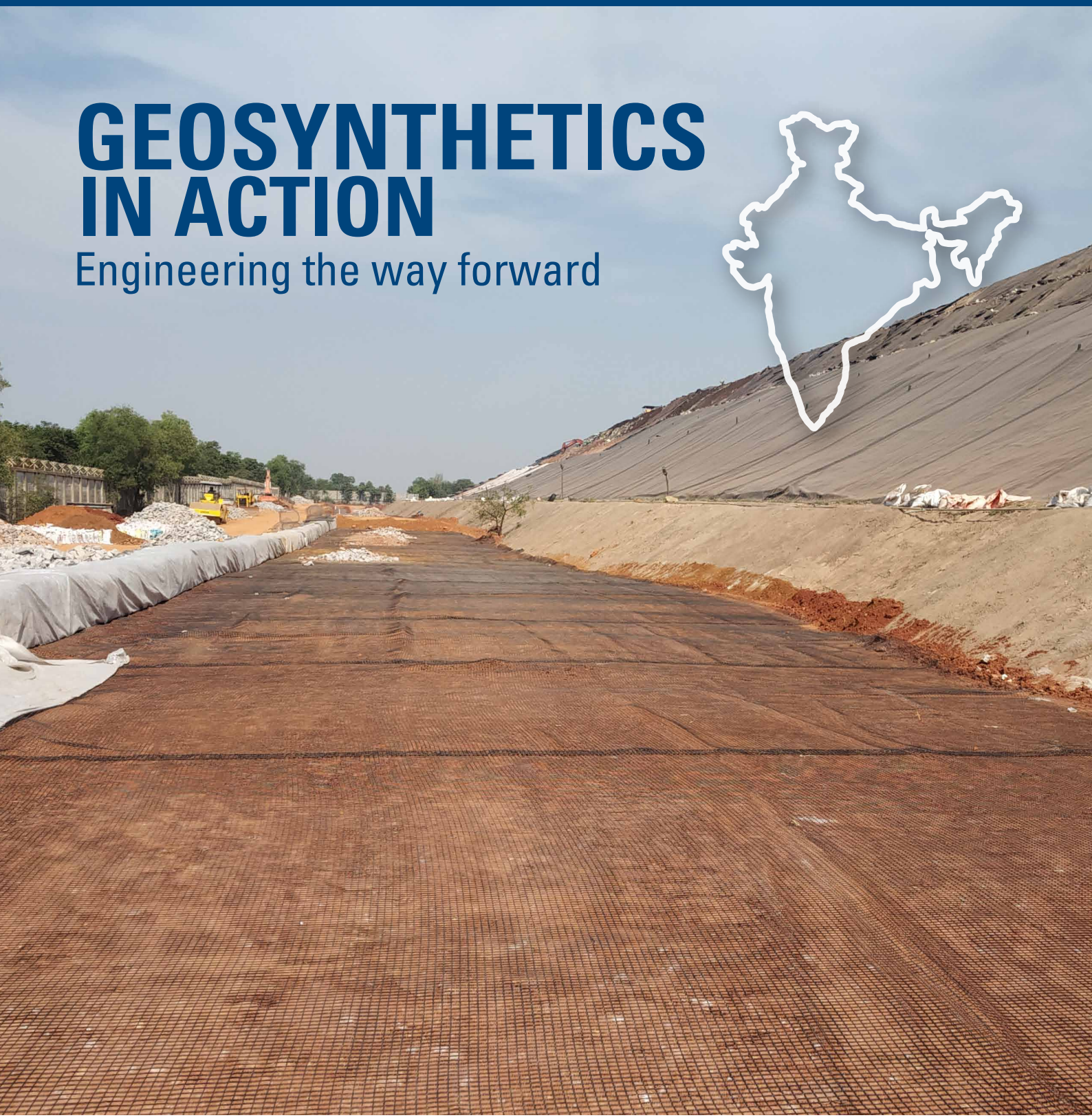
GEOSYNTHETICS

NEWSLETTER

GEOSYNTHETICS IN ACTION

Engineering the way forward



TENCATE GEOSYNTHETICS

Foreword

This edition is very special as most of us are passing through a phase of unprecedented times of health crisis engulfed by anxiety and stress within our families and communities. Nevertheless, it has been proven once again that humanity is more resilient during these times than we could imagine, extending relentless help and support especially from Covid frontline workers and the like.

In these challenging times, our team has constantly engaged with our customers to meet their expected delivery timelines and to extend our technical support for their on-going project designs, providing the necessary support and input on installation needs to ensure their projects are on the right track. We have also made enriching engagements of knowledge sharing with our customers by organizing several virtual promotional events including webinars, technical brainstorming sessions and other possible means of meaningful interactive communication and connection.

We have had the opportunity to derive some interesting techno-commercial insights from some of our projects which are primarily innovation centric, and engineering value proposition in terms of design and construction cost. This newsletter takes special note on these project developments in Geosynthetics Engineering which includes reinforced soil slopes for capacity enhancement of a landfill facility and Geotube® engineered solutions for reclamation. These solutions have redefined the boundaries of value engineering by tweaking the productivity frontiers of the project, which would otherwise be distantly possible on a conventional technology platform.

Let's continue to remain connected and support each other as we weather through this crisis together. Stay safe.

4 > Evaluate The Value Added Performance in Soil Reinforcement

Miragrid® GX

8 > An Innovative Support for Sewage Treatment Plants

Geotube® Dewatering

6 > Geotube® Dykes for Land Reclamation

Geotube® System

10 > New Generation Multi- funtional Geosynthetics for Subgrade Stabilization

Mirafi® HPa

CONTENTS

TenCate Miragrid® GX
Leads The Way

> Miragrid® GX was used to expand the capacity of the existing landfill by increasing the bund height through the reinforcement of its soil slopes.

Evaluate The Value Added Performance In Soil Reinforcement

Rapid urbanization coupled with industrial growth has put the landfill management system under stress. Landfills are typically planned and designed in view of specific capacities to be handled within a given time frame. However, the landfill space is fully consumed much earlier than planned mainly due to unforeseen growth in public usage especially from civic and industrial bodies. The problem is compounded if the landfill owners have limited space to expand their capacity horizontally. Under such circumstances, the landfill authorities must find another location to build a new landfill or look for options to expand vertically. The former is often not a preferred choice as it needs higher Capex and involves higher operating expenses.

Limitation of space at landfill sites while optimizing the increase in its capacity appear to be paradoxical. Landfill owners prefer to enhance the landfill by rising the dyke vertically. Amongst several options available to increase the height of the bund, reinforced soil slope is the most attractive option due to its technical feasibility, economics and speed of construction.

In one of our projects where the capacity needed to be enhanced for pharma waste, similar challenges of space limitation were present. The project authorities designed the capacity augmentation program by adopting reinforced soil slopes, having a bund height of 9 m with a slope angle of 70° to meet the desirable capacity requirements for landfill waste.

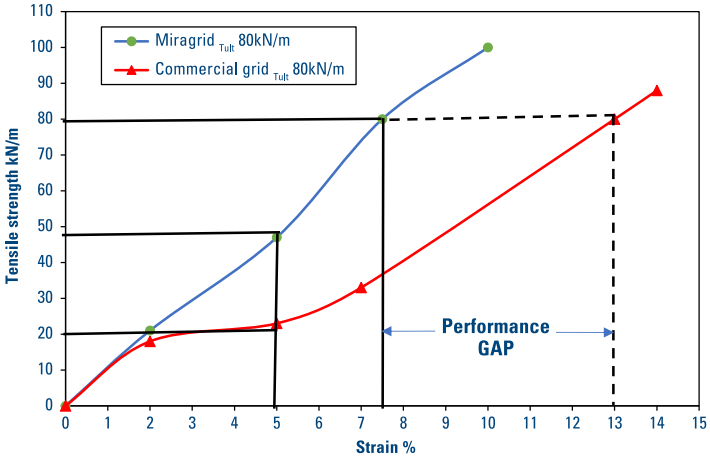
> With the higher factor of safety attained with the long-term design strength of Miragrid®, the structural integrity of the bund is enhanced.

The authorities have chosen TenCate Miragrid® as reinforcing material which exhibit the necessary reinforcement function having tensile strength at a very low strain of less than 8% to contain lateral movements. Minimizing post construction strain would limit long term structural deformation. Additionally, a higher factor of safety is attained with the long-term design strength of Miragrid® which enhances the structural integrity of the bund. This effectively safeguards the lifetime performance of the landfill system from leakages or failures.

Miragrid® GX exhibits tensile loads of 55% of the initial tensile strength at only 5% strain which makes the materials very efficient in carrying tensile loads at relatively low strains. The reinforcement bund was designed with tensile strengths varying from 60 kN/m to 130 kN/m spaced at 0.6 m. A gabion facing system was used on the outer side of the reinforcement bund and wrap-around facing with soil bags on the inner side.

The innovative and engineered reinforced bund solved the most typical problem of land scarcity and helped enhance an additional one lakh tons of landfill capacity using TenCate Miragrid® as reinforcement.

Comparison of High Performance Miragrid® to Commercial Geogrids



Geotube® Dykes for Land Reclamation

TenCate Geotube® is typically used in any reclamation activity including sea-link road projects, coastal road projects, port expansion activities etc. In the design and development of port infrastructure, land space availability is one of the most challenging propositions. Reclamation of land towards the seaside is one of the sought-after choices and is often challenging.

Reclamation projects are feasible only when the dredged material pumped into the designated space gets retained and the land gets reclaimed. The conventional rock dykes may not be a good choice when the dredged fill material consists of finer sediments which has the potential to escape along with the reversing wave or tide. It may be much more challenging to build a rock composed reclamation dyke when we encounter soft foundation soil as the rock dyke is subjected to deformation and/or risk of stability failure. Further, conventional rock fill dykes are often slower to construct and doesn't catch up with the pace of dredging activity.

TenCate Geotube® dykes are designed to be used in construction of reclamation dykes to meet the expected designed geometric configuration. The Geotube® dykes offer monolithic and flexible structures wherein distribution of the overburden stresses is much more effective than a conventional dyke.

Geotube® dykes typically comes in diameters of 2 m – 5 m to achieve filled heights ranging from 1 m to 2.3 m. The dyke can be designed in stacked fashion or in a pyramid fashion depending on the height criterion, and to support foundation stability requirements. The Geotube® dyke is much more economical than a conventional rock dyke especially for large scale projects. The most attractive value proposition comes from its speed of construction making it suitable to catch up with the progress of dredging activity along the length of the reclamation. TenCate Geotube® dykes contribute to lowering carbon emissions due to lesser consumption of rock thus making it an environmentally friendly solution.

Geotube® Dewatering Technology: An Innovative Support for Treatment at Sewage Treatment Plants

India has witnessed robust connectivity across the country in the last two decades which primarily led to a distributed economic activity instead of a cluster development. While this prevented the fallout of civic infrastructure in already stagnated urban centres, it has posed a greater challenge in building new civic infrastructure to the ever-increasing needs of the growing population density among tier-II and tier-III cities in India.

One of the key areas of concern is to address the treatment of wastewater generated from human and industrial consumption. The lack of appropriate infrastructure to treat wastewater would mean allowing contaminated water into lakes, rivers and other bodies of water which not only endanger the environment but leaves mankind in jeopardy. The local authorities have taken up the mission of treating wastewater by setting up sewage treatment plants (STP) and allowing clean effluent to flow into natural water bodies. However, the STP's are stressed out in meeting the increase of wastewater for treatment and its inability to cope up with the surge in demand for treatment in a short time span. The excess burden on the STP's coupled with a reasonably high probability for a STP breakdown carries the potential risk of leaving the treatment system in disarray.

In STP's, digestate is released into facultatively aerated lagoons (FAL) or ponds to enhance dissolved oxygen levels using aerators and settle the suspended solids. The permeate of the tank is further polished in a baffled sedimentation cum chlorination basin to treat the water. But the accumulated solids may be captured using any mechanical treatment methods like filter press, belt press etc., in which the volumes are defined and cannot accommodate capacity enhancement in a short time span. This can pose a greater operational challenges for the authorities.

The extra volume of sludge will eventually slow down the process and result in direct accumulation in the aerated lagoons beyond the allowable limits. The presence of high solids will reduce the volume of the designed aerated pond which reduces the depth of the tank. This in turn further complicates the operational mechanism of the STP.

TenCate Geotube® Dewatering technology can complement STP's in dealing with the sudden surge in wastewater sludge or during the events of maintenance or breakdown. Geotube® Dewatering offers a technically efficient and agile solution to accommodate the increase in wastewater with very minimal capital investment.

Geotube® Dewatering technology can easily enable the removal of sludge accumulated at the base of the aerated lagoon and free the capacity of the aerated lagoon for future sludge deposition. This directly compliments the operations of STP's.

Key benefits of Geotube® Dewatering Technology
• Low capital investment option
• Complements existing STP's
• Easy scale-up to handle large volumes of sludge with minimal investment and time
• Geotube® dewatering technology does not pose any health hazards, reduces odour problems and operates noise free

> Geotube® dewatering technology is an innovative solution in dewatering primary, secondary and overflow sludge from sewage treatment plants' digesters and lagoons

TenCate Mirafi® HPa

New Generation Multi-functional Geosynthetics for Subgrade Stabilization

To facilitate a seamless operation in construction, builders locate stock yards, concrete batching plants, casting yards and the like along the side of highways. The choice is generally driven by the access to the highways or roadways, and preferably to be equidistant from any point of the entire stretch of road under construction. These requirements leave limited scope to select the most suitable site which has levelled ground and adequate bearing capacity to support the intended loads from the yard.

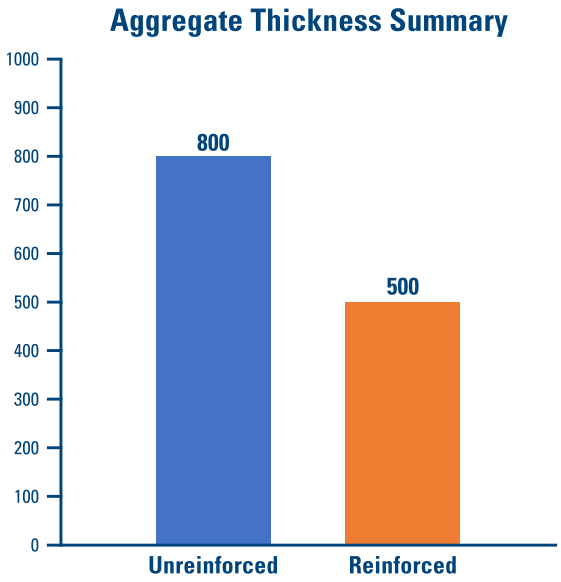
In most cases, batching plants or stacking yards are prepared on agricultural fields or water-logged areas etc. where the subgrade has a low CBR. The poor subgrade soils tend to soak up during the monsoon season and vehicular movement with heavy loads will result in the formation of ruts and lateral deformation of the fill soil. In some cases, the vehicles may get stuck in the rut posing a threat to the operation of the yard. The owner of the yard shall have to consider the possibility of the formation of ruts and deformation of fill under saturated conditions to arrive at the design fill thickness. It is generally much higher (> 60%) than required for a reasonably strong subgrade soil which eventually increases the cost for fill material and maintenance.

To minimize the cost of fill material and mitigate the risk of subgrades not performing under heavy loads, it is viable to design the subgrade by incorporating a layer of engineered material such as a high performance multi-functional geotextile. A multi-functional geotextile incorporates the functions of separation to prevent intermixing fill material into soft subgrades, reinforcement to distribute the load to the subgrade effectively and permeability to allow a passage for pore pressure during vehicular stress.

Furthermore, the multi-functional geotextile has the added advantage of reducing the fill material thickness to minimize cost by 30%-40%.

TenCate Mirafi® HPa high modulus woven geotextile layer is made from 100% polypropylene (PP) with high tenacity monofilament yarns designed as a multi-functional geosynthetics material. Mirafi® HPa exhibits the ability to take higher tensile loads at low strains to develop a mechanism of lateral restraint and distribute the load effectively to minimize vertical deformations thus minimizing rut depths. Mirafi® HPa with its inherent capability of high vertical flow rate dissipates pore pressure instantly to avoid a drop in shear strength of the subgrade.

From an economic perspective, Mirafi® HPa has saved significant immediate costs by reducing the volume of fill material used and the maintenance costs thereafter. The productivity of the yard was efficient with the increase in the number of trips made on a daily basis. This met the objectives of the construction site to save time by a minimum of 20% to 25% which ultimately converted to 10% to 15% savings in the overall costs of the project. Indirect cost savings also contributed from the efficiency and increased productivity of the yard.



*Visit us at **www.tencategeo.asia.***

*Contact our Geosynthetics Specialist for more information or write to **info.asia@tencategeo.com.***

TenCate develops and produces quality products that increase performance, reduce cost, and deliver measurable results by working with our customers to provide advanced solutions.

India
Tencate Geosynthetics India Pvt Ltd.
Vishwasri GL, Plot No 5, IInd floor,
Vijay Nagar Colony,
Behind Secunderabad Club, Picket,
Secunderabad - 500003 Telangana,
India

Tel: +91 40 2770 1271 / 1273
Fax: +91 40 2770 1276
Email: info.asia@tencategeo.com

www.tencategeo.asia

TENCATE GEOSYNTHETICS