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The latest news magazine from the NAUE Group

NAUE NEWS

Onward to New Shores!

NAUE GmbH & Co. KG opened a new chapter in the history of the company by officially opening a plant in Malaysia on 19th May, 2011. The newly founded NAUE Asia Sdn. Bhd. is the first 100% production subsidiary of the company outside of Germany. Our Bentofix® geosynthetic clay liners (GCLs) have been in production since May 2011 at the state-of-the-art 53,820 square feet (5000m²) production hall.

The new plant is located in Selangor, which is approximately one hour's drive from Kuala Lumpur and only a few miles from the key international container port of Port Klang. This site proved perfect for NAUE. The long delivery time from Germany, the high freight costs, and, for some countries, customs duties had complicated our interaction with Asian markets. We wanted to offer more convenient, regionally based production. We are absolutely convinced that this has been the right move. We are more competitive. Our materials are available more quickly. With an ideal shipping location, we foresee sales of our Bentofix® GCL products increasing in Asia, Australia and Africa. Additionally, we believe that related products from Germany, such as Secutex®, Secudrain® and Secugrid®, will also see growth in demand. As the new site in Malaysia grows, our Germany-based plants will also be busier.

The Selangor plant required more than a year of intense planning and preparation, and almost all specialist departments took part. We are particularly proud of the fact that the production starting date that was set in 2010 was kept almost to the day and that the quality of the products made in Malaysia is just as high as that of our German products. A special thank you to all employees for this superior performance! The NAUE crew celebrated the opening in Malaysia with customers from Asia, Africa and Australia. The most prominent guest at the "Grand Opening" was Malaysia's Minister of Works, Dato' Shaziman Bin Abu Mansor. In his speech, he emphasized the fact that it is the declared goal of Malaysia to become a leader in "green technology" in the region. In this segment Germany, in particular, is considered to be the world's leader and therefore, companies from this segment are especially welcomed in Malaysia. The minister helped to cut the red ribbon and successfully commissioned the production facility. We thank our many guests, who in some cases put up with long drives or flights to celebrate with us a day that was so important.

Official ribbon cutting with Dato' Shaziman Bin Abu Mansor, Ministry of Works (right) and Alexander Naue

Lightning-fast start

Last year, NAUE News ran a headline of "Cold Start" with reference to the long winter and the less than stellar sales that were due to the weather. In contrast, we are able to talk of a lightning-fast start this year. Since most of Europe remained largely free of snow and frost, we were able to make deliveries to many building sites already in the first quarter, and sales increased markedly in comparison to the previous year. The only bitter pill was and is that the costs for raw materials are increasing continuously. They have climbed steadily upwards since November 2010, and their further development cannot be forecasted in a dependable manner. Overall, though, we remain very optimistic for 2011. The high costs of raw materials do not change anything regarding the economic superiority of geosynthetics when compared to traditional construction measures, and geosynthetics succeed further when project owners take into account the long-term ecological and sustainable advantages of our technologies.

CONTENT

Further information:
www.naue.com

Geogrids Prevent Airplane Damage

Secugrid® stabilises take-off and landing strips in Berlin

What do geogrids have to do with airplanes? When Airbus and Boeing jets fly, their journeys must begin and end on a solid foundation, which includes essential support on the edges of these runways. At the Berlin-Brandenburg International Airport, Germany, NAUE products are used: Secugrid® for primary stabilisation and Carbofol® for surface runoff protection.

Runways at the Berlin-Brandenburg International Airport (under construction) cover an area of approximately 1,470ha. The design of the runways is quite complex. Runways are 60m wide but are complemented on both sides by a 75m wide strip, which is in turn divided into several functional areas. Immediately next to the runway is an asphalt strip with shoulder and fire protection zones in which, among other things, runway lighting sits.

Surface water flows from the runway onto the paved shoulder, then directly into a vegetated wetland with coarse drainage sand for filtering elements such as deicing agents, oils, fuels and more.

These runoff collection zones (and the groundwater and soil beneath) are protected from seepage by geomembrane. More than 70,000m² of high-density polyethylene (HDPE) NAUE Carbofol® 508 were installed. Also, the filter strip area must be extremely strong and stable, in case a plane veers off the runway. Preventing a more serious accident includes making sure the wheels do not sink too deeply into the vegetated strip.

Also, these strips must support and allow quick, safe access for emergency personnel. To stabilise the runway edges, Secugrid® 80/80 Q1 reinforcement geogrids were installed above the soil filter layer. Secugrid® is characterized by exceptional durability, high rigidity, and strong resistance to tensile forces, including at low elongation. These factors distribute stress quickly, effectively and safely to maintain runway integrity.

Approximately 280,000m² of Secugrid® 80/80 Q1 were installed above the filter surface. Above the geogrid, a 30cm thick gravel layer was placed.

Along with the runoff control, runway shoulder stabilisation was installed. The nearly 500,000m² of installed Secugrid® 30/30 Q1 made up the bulk of the geosynthetics supplied to the project by NAUE. This geogrid was laid on the prepared subgrade. Next came a 30cm thick gravel layer, 15cm of top soil and then vegetation.

Construction work was carried out by a consortium of Max Bögl, Eurovia VBU and Eurovia Beton. The collaboration was found to be both pleasant and professional.

The opening of this new, modern airport is planned in June 2012, and the metropol of Berlin will have a junction point for airplanes, trains, metros and busses under one roof.

Did you know...?

NAUE Relaunches www.naue.com with New Design

New content and geosynthetic resources lead the way

In 1998 the internet was still unknown to many people and unused by many businesses, but NAUE was eager to use this new and modern technology. We launched our first website. While a number of small updates and amendments were made over the years, the website was totally rebuilt this June. A new, user-friendly platform provides comprehensive information about geosynthetics. A key aspect of the www.naue.com redesign is its practical approach to providing useful information that supports and is supported by the other sections on the website. For example, the new NAUE.TV section offers HD-quality technical films that explore various geosynthetic applications. The "Applications" section offers additional details on these design approaches and the different engineering fields in which geosynthetic products are utilised. The "References" section contains detailed project reports with pictures and graphics of exemplary uses.

NAUE's extensive product range is also explained in detail: functions, durability benefits (e.g., sustainability), etc. Other highlights of the redesign include simplified communication with key NAUE Group contacts and our new G-map outlining NAUE locations. Whether you're looking to reach our headquarters or one of our many subsidiaries around the world, you will find information for direct contacts on the new website. Capitalising on the importance of social networking, the new NAUE.com also enables bookmarking and sharing on various social networks. And our revamped intelligent search operation helps users find useful information even faster on the website. NAUE's multilingual website is currently available in German/English and will soon be expanded to as many as 10 languages. New programming has also been planned for NAUE.TV.

For further information contact Kent von Maubeuge, kvmaubeuge@naue.com.

We welcome your feedback.

NAUE Soft Rock for Off-Shore Wind Turbine Foundation Scour Protection
An Alternative for Alternative Energy

Conventional scour protections for off-shore installations are difficult to install and secure. Currents complicate foundations, creating a situation in which the installation will not be stable in the long-term. Deep foundations are prohibitively expensive.

In the growing wind farm sector, the large, heavy turbines must be protected against the erosive effects of normal or sudden, strong and storm-induced currents. A durable and effective alternative has been found for securing these off-shore turbines: NAUE Soft Rock.

The Need

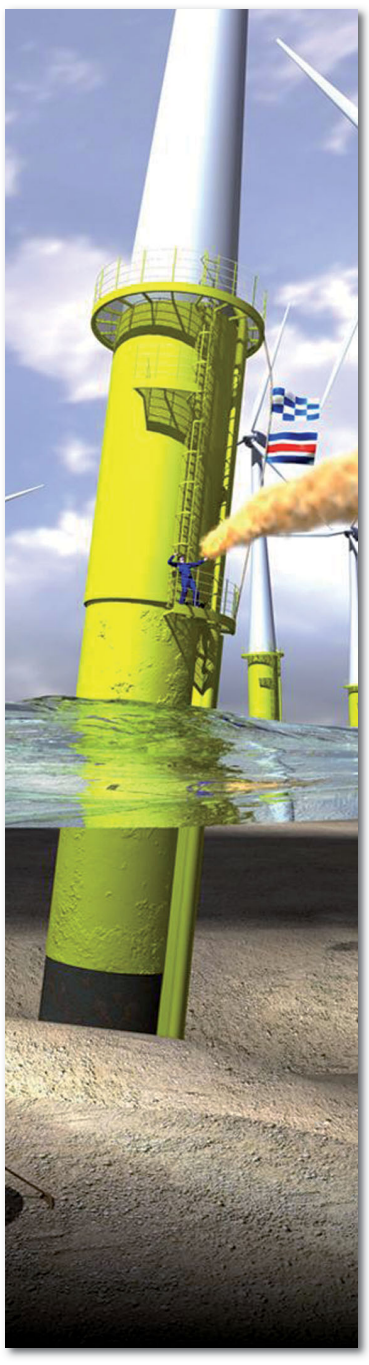
Scour protection has commonly been provided for underwater foundations by a combination of a low granular filter weighted down with stone armor. The hydraulic impact in the design has determined the amount of heavy stone needed. The overall effect of these conventional systems is to defray water forces while preserving fines. If the fines were allowed to erode, the foundation might be evermore exposed until the stability of the structure above is threatened.

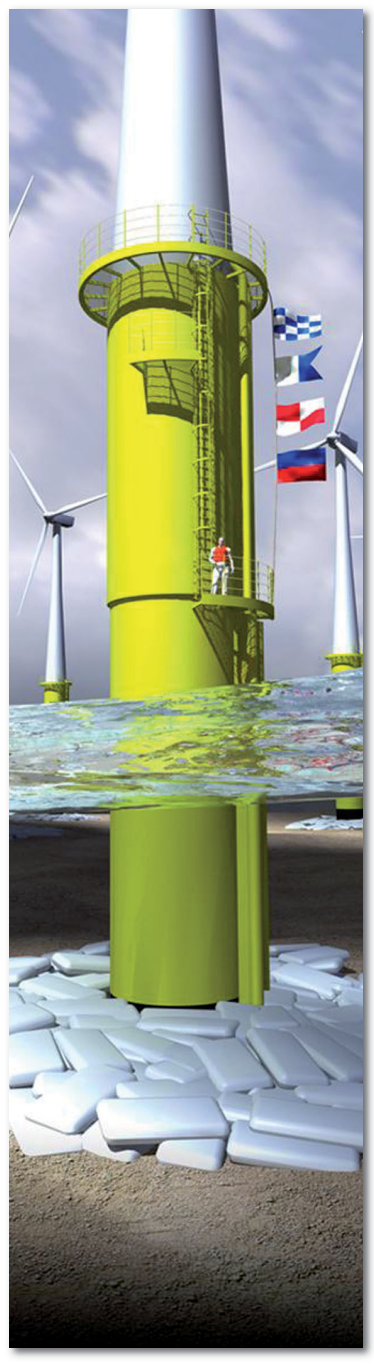
For the wind farm industry, which has grown tremendously in recent years, off-shore installations are highly attractive due to the space and the frequent, steady strong winds. Open water installations provide a steady source of alternative energy production.

The development of NAUE Soft Rock for monopile foundation scour protection brings a durable, flexible, softer and well-established alternative technology to turbine foundation stability. Soft Rock sand containers have been used in many flood control installations. For example, more than 48,000 Soft Rock sand containers were installed in 1993 for one of Germany's largest-ever flood barrier and scour protection installations.

That installation, overseen by the German Federal Waterways Engineering and Research Institute (BAW), took place on the Eider River and helped underscore how effective mechanically bonded nonwoven geotextile containers could be. Proving their durability, the containers were even installed using a stone dumper.

In 1997, a permanent scour protection installation was carried out along the Peene River in Germany. Pile moorings were secured with 1m³ sand containers.





Advantages

Soft Rock is a sand-filled container made of nonwoven staple-fiber geotextiles. They provide durable, wave energy-diffusing, erosion-limiting performance but allow enough porosity that some water may dissipate through the Soft Rock container's three-dimensional, nonwoven matrix. This energy absorbing approach allows for softer deflection and dispersal of waves.

Needle-punched Terrafix® and Secutex® nonwovens have high elongation characteristics due to the "flexible," non-brittle fiber junctions created by the manufacturing process.

Due to their superior high elongation characteristics, needle-punched non-wovens are more capable of accommodating soil irregularities, and are more resistant to puncture from imbedded stone or similar potentially damaging sources than geosynthetic products with low elongation properties, such as thermally bonded nonwovens or woven geotextiles.

NAUE Soft Rock advantages for wind turbine stability include:

- ☑ Proven long-term stability in marine/saline environments
- ☑ High abrasion-resistance
- ☑ Excellent frictional behaviour, including when containers are stacked
- ☑ Extremely robust against mechanical loads
- ☑ Flexibility adjusts to subsoil variations
- ☑ The rough surface of the needle-punched nonwoven geotextile contributes to absorption and adsorption of suspended substances and sand particles into the pore structure, providing additional scour protection
- ☑ 100% of the seam tensile strengths in the base geotextile can be achieved
- ☑ Prefabrication ability produces high quality in each container in the system
- ☑ Mobile sand-filling stations greatly improve site construction economics for large-scale installations
- ☑ As a soft armor solution, there is no risk of damage to the turbine and monopile foundation during NAUE Soft Rock installation, even in the case of mass installation

Supported by research

Though NAUE Soft Rock has been proven in numerous scour protection applications over the past 17 years, the suitability of the materials for off-shore wind turbine protection needed to be determined.

Large scale model tests were performed in the Large Wave Flume (GWK) at the Coastal Research Centre (FZK) in Hannover, Germany. Then, Germany's first deep sea wind farm, Alpha Ventus, confirmed the results.

Did you know...?

As of June 2011, the geosynthetic clay liner (GCL) Bentofix® X2 BFG 5300 has received the BBA certification for waterproofing applications.

During this investigation process, Bentofix® X2 BFG 5300 was tested and assessed on its behaviour against permeation of water, vapor transmission and gas permeability, especially against methane and radon.

Bentofix® X2 BFG 5300 is a directionally independent, shear transferring, needle-punched GCL with an additionally attached thin durable polyolefine membrane.

In waterproofing applications, this multicomponent GCL is mainly used where an immediate seal against gas is required.

Alpha Ventus was constructed in 2009 and officially opened in the spring of 2010. In addition to being a fully functioning off-shore installation for clean power generation, the site also serves as a base for significant research and testing. Among its projects, Alphas Ventus has carried out tests that have verified the suitability of Soft Rock geocontainers for foundation scour protection.

It is another example of how geosynthetics intersect and help improve all major sectors of civil and environmental engineering, from traditional road building to the latest in alternative energy facility construction.

Applying GCL Knowledge: Bentofix® IQ

When NAUE invented the needle-punching method of manufacturing geosynthetic clay liners (GCLs) in 1987 it entirely changed the field. The innovation significantly increased the shear strength of GCLs, which expanded their range of applications. Now, as NAUE nears the 25th anniversary of this development, the company is drawing upon its quarter century of Bentofix® GCL expertise in a new information series called Bentofix® IQ.

Bentofix® IQ addresses four subject keys to understanding geosynthetic clay liners (GCLs): Technics, Quality, Application and Ecology. To provide a general thematic guide to understanding the essential design and barrier selection criteria, the Bentofix® IQ approach utilises the classical four elements of water, fire, earth and air in describing proper GCL production, design, application and installation.

Technics (Water) focuses on how the high-quality, high-swelling powdered sodium bentonite in the core of Bentofix® GCLs creates the exceptional barrier against liquids that defines this class of geosynthetic. Also, the Technics brochure looks at how the unique needle-punching increases the internal shear strength and how the nonwoven geotextile outer layers provides the necessary long-term protection against physical, mechanical and hydraulic stresses.

Quality (Fire) analyses the importance of GCL components from the quality of the bentonite grade to selection of nonwoven fibres for the protective geotextile layers. The Quality brochure also outlines the importance of the Bentofix® Thermal Lock process which uses heat to thermally bond the entangled nonwoven geotextile fibres with the high grade bentonite, thus increasing pullout resistance. GCL service life is extended and factors of safety improve.

Application (Earth) explores the range of uses for Bentofix® GCLs: hydraulic applications like dams, canals, and levees; landfill applications such as caps and base seals; infrastructure environmental protection such as beneath roads and railways and within noise barriers; and other containment applications such as used in the mining industry, secondary containment (e.g., fuel tank farms), tunnel lining, and more.

Ecology (Air) shows the many ways in which the selection of Bentofix® leads to significant environmental benefits. For example, the carbon footprint of a project is greatly reduced when GCLs are used instead of conventional compacted clay for a barrier layer. Though significantly thinner, Bentofix® greatly outperforms clay-only liners and requires only a fraction of the site space and transportation and installation costs. Backed by data proving the success of Bentofix® GCLs in the reduction of energy consumption, the Ecology is an essential reminder of just how important the proper barrier design and selection is not just for project performance but for the long-term protection of the environment. We invite you to experience the Bentofix® IQ series. And we hope you will share your project stories with us so that we may continue to apply and share our joint knowledge regarding better barriers and smarter engineering.

To receive your copy of the Bentofix® IQ series, contact Kent von Maubeuge (kvmaubeuge@naue.com).

Combigrid® Reinforces the Sălbatica Wind Farm, Romania

The Sălbatica Wind Farm in Romania's Dobrogea region near Tulcea is operated by an Italian energy producing company, which has installations not just in Europe but in North and South America. From an energy generation perspective, Dobrogea is one of the best places in Europe for the construction and operation of a wind farm. Its open lands are characterised by some of the continent's most dependable, strong winds. The Italian producer foresees developing as much as 500MW of renewable energy in Romania.

The Sălbatica Wind Farm involved the construction of 70 turbines each producing 2MW of power. The annual production of the site is 85.5 million kWh/year. This is enough to power 29,000 households. Equally important, from an environmental standpoint, is the reduced carbon footprint. Sălbatica's turbines produce power that if produced by traditional means would have released 48,000 metric tons of CO_2 per year. That pollution is prevented through Sălbatica's renewable energy approach.

Phase II of the project started in 2010. Additional 35 Moline Gamesa G 90 windmills have been planned, each possessing the same 2MW output of the first phase's turbines. The logistics involved in constructing wind turbines of this size are not simple.

The towers are 100m high and built of 5 segments that weigh roughly 65 tons each. For every windmill, eight transport stages are needed: 5 for the pole segments, 1 for the blades, 1 for the nacelle, and 1 for the propeller axle. Erecting them requires heavy cranes. Here, Liebherr 750Tm cranes (roughly 550 tons themselves) were used, assisted by auxiliary cranes of 150, 200 and 500 tons.

Without the aid of reinforcement, just getting the materials and equipment to the proper places on site would be a significant challenge. Site access roads are subject to tremendous loads and must be properly designed and supported.

The existing modulus at the roadway excavation level, for example, was 40-50MPa. This would not be sufficient to support the designed loads of Sălbatica's second phase. Approximately 40km of access roads were to be constructed and each turbine would require its own crane pad. Roughly 80 truckloads of crushed stone were delivered each day, and each truck carried 35 to 45 tons of aggregate.

The design called for roads that could resist 10,000 traffic cycles, and all of the oversized transports meant that additional loads of 65 to 95 tons per truck were regularly rolling across the site. Furthermore, the heavy need for concrete in the turbine/crane pads meant that another 20 to 80 trucks per day (the concrete mixers) were needed. To maximise access road performance and survivability, engineers specified the installation of 150,000m² of Combigrid® 30/30 Q1 151 GRK 3C reinforcement geogrids.

Combigrid® is a truly unique reinforcement product. It delivers four key geosynthetic functions in one composite material. NAUE's patented manufacturing techniques combine the reinforcement strength of a geogrid (NAUE Secugrid®) with the filtration, separation and drainage of a nonwoven, needle-punched geotextile (Secutex®). The result is a robust, long-term geosynthetic reinforcement material that significantly improves soil bearing capacity while preventing any mixing of fines that might destabilise heavily-loaded roads.

The placement of a 20cm crushed stone 0 to 45mm over Combigrid® produced a modulus of 90-130MPa. The placement of a second 20cm crushed stone layer (0 to 63mm) obtained a modulus of 130-170MPa - more than safe for this design.

The wide Combigrid® rolls that were delivered to the Sălbatica site made access road construction more convenient too. Greater coverage per roll and easy-to-install rolls meant a more efficient, more economical installation process. Less downtime, quicker access.

The selection of Combigrid® saved the project partners significant time and money while guaranteeing immediate and long-term safety and quality.

Did you know...?

New Principles for Geotechnical Design - Eurocode 7

In December 2004, Eurocode 7: Geotechnical Design – Part 1: General Rules (EC 7-1) was ratified by the European member states.

This prompted a two-year calibration period, during which member states had to write the National Annex to EC 7-1 that serves as the link between EC 7-1 and national standards.

Following this calibration period, a three-year coexistence period took place, culminating in EC 7-1 becoming valid in all member states around 2009. National standards covering the same items as EC 7-1 then had to be withdrawn.

It will be mandatory for all member States to accept designs to the EN Eurocodes. Therefore, EN Eurocodes will become the standard technical specification for all public works contracts.

It will not be mandatory to design to the EN Eurocodes in a particular member state, but a designer proposing to use an alternative design standard will have to demonstrate that the alternative is technically equivalent to an EN Eurocode solution.

For the design of Geosynthetic Reinforced Soil Structures, the 2010 issue of e.g. EBGEO (Germany) and BS8006 (UK) are referenced in the National Annex of the respective member states as their decisive guideline for the design of the geosynthetic components.

The new EC 7-1 moves away from "Working Stresses and a Global Safety Factor as calculation result" to a Limit State Design approach, which uses partial safety factors for actions (loads), material (soil) and resistances to finally show an equilibrium between actions vs. resistances.

For more information contact: Mr. Jörg Klompmaker, contact@bbgeo.com

Did you know...?

The European CE marking certifies that products sold in Europe, specifically in the EEA territory fulfill the product specific requirements according to the application related standards, which are valid for nearly all geosynthetic products. Products produced by NAUE in Germany fulfil this requirement and since July, 2011 the needlepunched geosynthetic clay liner Bentofix® produced in Malaysia is allowed to carry the CE marking.

There is a lot of talk about quality – we implement it. Now even in our production facility in Malaysia. After the successful establishing of the current German quality management system (QMS) according to EN ISO 9001 the German TÜV Nord /TÜV Cert has certified the Malaysian operation according to ISO 9001 end of June 2011.

Preserving Arran's Coastline

When the picturesque shore on the Isle of Arran in the Firth of Clyde (just off the west coast of Scotland) was threatened by erosion, NAUE geosynthetics were brought in to provide an environmentally welcomed, aesthetic, long-term design.

Brodick, Arran's main town, is situated on the island's eastern coast. The shore is comprised of a fairly narrow band of mixed grass, sand, rock and shingle. The coastline suffers significant erosion from constant wave attack. This affects some 250m of beach and has been a cause of concern for local residents.

The erosion even unearthed a restored landfill, which heightened the concern with the stability and environmental soundness of the beachfront. The landfill in question was closed around 1950 and restored with topsoil and marram grass (a simple, common approach in the time before geosynthetic caps). When this site was exposed by shoreline wave erosion, a rectification project was undertaken by North Ayrshire Council's Infrastructure and Design Service. This included the selection of two geosynthetic solutions: Soft Rock Type E (R601) sand containers and Terrafix® 609 geotextile for filtration, erosion control and scour protection.

Armoured rock solutions were considered, but the cost was deemed to be prohibitive (in part due to scarce, acceptable local supply). Also, they were not considered aesthetic enough. Sandfilled geotextile bags, however, met the project's budgetary goals and could be blended into the environment.

NAUE's sand containers arrived on site in an unfilled state. This minimised transportation costs and allowed the project to utilise locally sourced fill. It also helped the small island's economy, as a local contractor, Murchie Sand and Gravel Ltd., was able to carry out the work. No special labour was required.

The Soft Rock Type E R601 sand containers used on the project are made from a white polypropylene, single-layered, mechanically bonded non-woven geotextile sewn with a special seam to form a seal. The sand containers have a floor area of about 3.5 sqm and each container is able to carry a mass of up to 2 tonnes. When sealed, the pillow-shaped sand containers measure about 300mm thick.

Material was excavated to show the front row of sand containers to be placed to a depth of about 1m below the surface of the beach. NAUE's Terrafix® 609

was installed as a filter/separator between the sand containers and the loose material to ensure material stayed in place to provide the protection from the coastal erosion. Able to trap sand in its pore spaces, Terrafix® 609 was designed here to replicate the buffeting effects of sand without the sand being removed. The excavated material was then backfilled into a buffer zone between the shore line and the old landfill. Terrafix® 609 is a staple fibre needle-punched non-woven geotextile. Its three-dimensional fibre structure creates labyrinth-like pore openings that closely simulate soil structure and its hydraulic properties. In retaining soil while remaining permeable to water, the geotextile allows root growth so that bank protection structures will blend unobtrusively with the natural environment but is durable enough to resist being torn apart by those roots. More than 30 years of projects have proven the versatility, filter stability, and resistance to abrasion of Terrafix® geotextiles.

Once all of the sand containers had been placed in position, they were covered with more sand – a planning requirement which met the concerns of the local residents about the appearance of the finished job.

The work has created a new and definitive boundary between the marram grass and the beach, whilst providing a 4m corridor of newly reclaimed beach. Most importantly, the work has overcome the problem of 70-year-old rubbish finding its way onto the coastline.

Today, Brodick's coastline is safer and more durable, and its aesthetic character has been preserved.

Exhibition and seminar schedules

July		
18. - 21.07.11	*XVth African Regional Conference on Soil Mechanics and Geotechnical Engineering*	*Maputo, Mozambique*
25. - 27.07.11	*AAEC Asian Australian Engineering Congress*	*Kuching, Sarawak, Malaysia*
September		
07. - 10.09.11	*IGEM - 2nd International Greentech & Eco Products Exhibition & Conference Malaysia*	*Kuala Lumpur, Malaysia*
07. - 10.09.11	*HTG-Kongress (Hafentechnische Gesellschaft e. V.)*	*Würzburg, Germany*
12. - 15.09.11	*XVth European Conference on Soil Mechanics & Geotechnical Engineering*	*Athens, Greece*
14. - 16.09.11	*3rd International Exhibition of Railway Industry*	*Teheran, Iran*
22. - 24.09.11	*Geosynthetics India*	*Chennai, India*
October		
02. - 06.10.11	*Pan-Am CGS 2011*	*Toronto, Ontario, Canada*
25. - 26.10.11	*4th International Conference Geosynthetics Middle East*	*Abu Dhabi*
26. - 29.10.11	*Pollutec Maroc*	*Casablanca, Morocco*
November		
07. - 08.11.11	*Foundations Brno*	*Brno, Czech Republic*
08. - 11.11.11	*CommunTech 2011*	*Kiew, Ukraine*
December		
06. - 08.12.11	*STUVA 2011*	*Berlin, Germany*

Psst! It's Secutex® PSS and Secugrid® beneath the Heidebahn

NAUE geosynthetics and a large, fascinating subsoil improvement machine help the Heidebahn rail network expand.

Among numerous upgrades to its stations and tracks, operators of the Heidebahn railway wanted to reduce its travel times; but upgrading the rail network to support higher speeds would require subsoil improvement. Combigrid® 40/40 Q1 151 GRK 3, Secugrid® 40/40 Q1 and Secutex® PSS contributed to the line's successful renovation.

The Heidebahn is an important piece of Germany's railway system, connecting Hamburg/Buchholz in Nordheide with Hanover, the capital of the German state of Lower Saxony. This old connection is used significantly by both commuters and visitors between these two major urban centres. To modernise the network and increase its value to riders, the Northern Region division of Deutsche Bahn AG (DB) decided to expand the line, investing more than 100 million euros in the project. Construction measures included establishing handicapped-accessible train stations, installing a new signal technology, and increasing the maximum speed from 80 to 120km/h. However, the tracks would need to be reinforced or entirely replaced to support higher speeds, and track equipment would need to be adapted. NAUE geosynthetics were identified as an ideal solution to the track improvement concerns. Over the past two years, various sections of this key railway link have been upgraded with NAUE reinforcement and subsoil securing technologies.

Improved Load Distribution

The route's various subsoil conditions, which ranged from sandy to cohesive soils, needed to be strengthened. Combigrid® 40/40 Q1 151 GRK 3 and Secugrid® 40/40 Q1 reinforcement geogrids were selected for use. Both products are certified for use in railway applications (manufacturer-related product qualifications [MPQ]). With their flat-bar construction and strong junctions, these geogrids improve how loads are distributed through the subsoil. Their intrinsically rigid structure and their high modulus at low elongations, in combination with the grain size of the subsoil material, Combigrid® and Secugrid® lock the subsoil in place and ensure the track superstructure's optimal safety and strength. And the Secutex® nonwoven in the Combigrid® structure ensured next to the reinforcement function the separation and filtering functions in areas where this was a concern.

A Geosynthetic Approach to PSS

Engineers determined that the load-bearing ability of the subsoil was sufficient in some areas but that the required filtering stability with the track gravel was not. In those zones, Secutex® PSS was installed to provide the essential separation and filtration functions. Secutex® PSS nonwoven geotextiles have been designed specifically to meet the requirements of the German railway authority (DB) and have received project-related approval certification from DB (in the style of the MPQ certifications). Under the specific boundary conditions, Secutex® PSS ensures the filtering stability between the subsoil and the track gravel. It's a technically appropriate and more cost-effective alternative to thicker, traditional PSS layers and construction methods.

The Subsoil Improvement Machine

Between the Schneverdingen and Handeloh stops, Combigrid® and Secutex® PSS were installed largely through the use of an impressive subsoil improvement machine (RPMW 2002-2) made by the H.F. Wiebe company. In this construction method, the track is lifted, the gravel is removed, the subsoil is reinforced and the new PSS layer and track aggregate is installed – all in a single, time- and labour-saving process.

The machine was easily able to incorporate Combigrid® reinforcement layers. Where Secutex® PSS nonwovens were installed, the track gravel was placed directly atop the Secutex® without any additional PSS. These rolls of geosynthetic materials thread smoothly into the work process of the subsoil improvement machine.

Finally, the new construction's superstructure was compacted as the final step to ensuring safe, long-term performance without additional maintenance.

To date, almost 50,000m² of Combigrid® 40/40 Q1 151 GRK 3, 24,000m² of Secugrid® 40/40 Q1 and more than 27,000m² of Secutex® PSS have been installed.

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