Issue 38 · November 2011 · 15th year [22nd English translation]

The latest news magazine from the NAUE Group

NAUE NEWS

2011 – a historical challenging year!

The year 2011 will go down in history as an extraordinary year – for the world and also for NAUE. Significant revolutions in Tunisia, Egypt and Libya occured, while in several nations protests and riots challenged other long-time rulers. These events have left many dead and injured.

In March, the massive earthquake in Japan and its subsequent tsunami led to the meltdown of a major nuclear facility in Fukushima. Thousands of people were killed and roughly 150,000 were forced to leave their homes due to radioactive contamination. These shocking events have unfolded alongside protracted economic concerns in the United States (the world's largest economy) and financial bailouts in Greece that are now prompting larger discussions about the euro's strength.

Despite these dramatic human and political events and the persistent uncertainty in financial markets, the real economy in many parts of Europe has actually not been hampered. The lowest unemployment rate since the reunification in Germany is one indication that in many parts of the world economies are succeeding. Record sales in Germankey industries such as automotive and engineering provide further proof. Also, the NAUE Group expects a new sales record to be achieved in 2011. Our manufacturing centers are running at full capacity; and the current order backlog suggests a strong first quarter for 2012. We are particularly pleased that this situation applies to our new production facility in Malaysia. As reported in the last NAUE News, we opened a Bentofix® Geosynthetic Clay Liner (GCL) manufacturing center in April 2011 in Selangor, about an hour's drive from Kuala Lumpur.

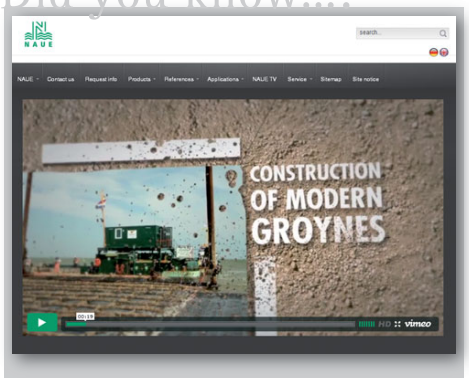
In its first 9 months of operation, the plant has produced materials for numerous successful construction projects in Australia and Asian countries.

The Selangor factory is certified by TÜV Nord in accordance with ISO 9001, meaning our customers receive the same security and quality from the plant in Malaysia as they expect and receive on the other side of the world in our German plants.

So we are well-positioned to work with our products to meet the application challenges of the future, such as strengthening environmental protection systems, developing better transport infrastructures, and providing safer, more sustainable systems for flood protection, coastal erosion control, and offshore wind turbine scour protection.

Questions remain, however, as to what extent the current debt and financial crises in various countries and banks will have on global economic stability. The uncertainty affects more than just the construction industry; in an interconnected world, it affects everyone. We can only hope that the recently announced measures to combat debt in Greece and to the rescue of the euro will be successful. We want to thank all our customers and suppliers for their cooperation and trust during what has been for the world in general a challenging year. And we want to thank all of the NAUE Group's employees for their continued dedication. We wish all readers a Merry Christmas and a Happy New Year, and we hope for a more peaceful 2012.

Did you know...?



NAUE TV releases new films

Technical films focus on geosynthetics and their applications

"Construction of the new A8 Highway with Secugrid®", "The Safe Coast" and "The Safe Landfill" are just a few of several film titles on our NAUE website (www.naue.com). Each film profiles and explains certain geosynthetics, their advantages and exemplary uses.

The high-definition, high-quality movies show installations and applications with NAUE geosynthetics. Stereoscopic computer animations help explain key functions and construction methods.

An easy-to-use menu bar appears on the bottom of your screen and helps put you in control, allowing you to change the volume, stop, fast forward, rewind and zoom.

We invite you to view our online movies and affiliated documentation at any time via the web address www.naue.tv.

CONTENT

Further information: www.naue.com

Terrafix® and willow bundles stabilise groynes in the Elbe River

Elaborate coast protection efforts at Altenbrucher Bogen

Gigantic Terrafix® mats have been combined with traditional willow bundles (fascines) in order to solve one of the most urgent problems of the Elbe River near Cuxhaven.

Between Cuxhaven and Otterndorf is an area called "Altenbrucher Bogen", literally the "Altenbruch bend". There, the Elbe River curves and the navigable water extends especially far from the shore. The strong currents in this area have caused continuous erosion to the shore. The natural mudflats have receded significantly in recent years, threatening the dike.

Furthering this waterway challenge, plans have been set in motion to deepen the navigable water. Greater depth will enable easy passage for large container ships regardless of the tide and improve access to Hamburg Harbour. This alteration of the waterway, if not addressed in improved shoreline engineering, would further increase the flow speed and cause additional problems for the dike and mudflats.

The solution for this dilemma has been found through the utilization of highly engineered, modern geotextiles and traditional fascines.

Officials from Lower Saxony and the Federal Water and Ship Association developed the concept for this permanent and secure shore protection plan. The core of the idea consists of 24 groynes extending into the Elbe River along the Altenbrucher Bogen to keep the river from eroding the ground further. The groynes of this ongoing project are being constructed up to 250m long and are being placed along the bend, covering an area of approximately 3km.

Filter mats for base protection

Above the water line, the groynes appear to be the same as traditional stone breakwaters. The special characteristics that define these groynes are hidden underwater, beneath the foundation: Large geosynthetic revetment mats, in combination with wood fascines, not only prevent tidal erosion but promote sand deposition.

Each of the special underwater mats are assembled on site and measure 30m x 70m. NAUE Terrafix® geotextile panels are unrolled next to one another at the shore and sewn together to achieve the desired size. Terrafix® 773 G43, a multilayer staple fibre nonwoven geotextile mat, has been selected for its performance and durability in coastline erosion prevention applications.

For the Altenbrucher Bogen area, the Terrafix® panels are needle-punched to a fabric layer equipped with loops. Ropes, which tightly bind the woody fascines to the geotextile, are pulled through the loops. The fascines consist of numerous willow rods bound into long round bundles several metres long. The fascines are fastened to the Terrafix® at a right angle, lengthwise and crosswise, spaced about 1m apart.

Tugboats, then, pull the fascine mattresses into position. Small rocks weight the fascine mattresses as they are lowered. Next, the actual groynes are built up using larger breakwater stone.

The groynes and fascine mattresses now provide mutual protection. The rocks hold the mattresses in place. The nonwoven fabric prevents erosion of the waterway bed. The fascine pattern promotes sedimentation. This creates shallow water areas with sand deposits between the groynes. It also makes those areas accessible and able to be used for leisure activities. The project is not yet complete, with a final phase planned for 2012. In total, it covers an area of 200,000sqm and is considered one of the largest water construction zones in Germany. The executors, "ARGE Buhnenbau Otterndorf", are comprised of the companies Heinrich Hirdes, Colcrete von Essen, Johann Bunte and Van den Herik. Essential support has also been provided by the Cuxhaven Water and Shipping Authority.

By the end of the project, approx. 220,000sqm of Terrafix® 773 G43 and approx. 30,000sqm Terrafix® B813 will have been installed.

Double Re-Design for the A1 near Didžiulio Lake, Lithuania

For the modernisation and extension of Lithuania's busy A1 Vilnius-Klaipėda roadway project, a major embankment needed to be widened to accommodate larger vehicles and increased traffic volumes.

The project designer, Kelprojektas, identified the need for geogrid reinforcement of this embankment early on. Some discussion was given to the potential need for added erosion protection along the lake-abutting slope in one area of the construction. The region receives a regularly high amount of precipitation.

With the slope being exposed to this precipitation during construction and the immediate post-construction period, more stringent erosion control was thought to be the best idea. However, the project directors initially selected the lowest cost design, which involved only the reinforcement. It was a decision they would soon reverse.

The utilisation of Secugrid® 40/40 Q6 geogrids allowed the slope-enlargement design to be built at a 1:1 incline, which was needed for the most secure footprint immediately adjacent to the lake. Also, the embankment had to be built to 6m in height. Construction went as planned, with reinforcement layers installed horizontally every 0.8m. A wrap-around, or envelope, method of geogrid placement was used.

In the middle of this summer installation, shortly before the slopes were completed, a sudden intense rainfall brought about a change in the design.

The precipitation caused significant washout of the clayey-sandy soils, affecting the newly laid roadway surface and some slope zones leading down to the water. The original design suggestions were revisited and this time the installation of erosion control matting was approved.

The project team chose Secumat®, a robust, three-dimensional erosion control mat with a UV-stabilised polymer core, able to withstand environmental exposure. This complex, durable matrix controls surface erosion and helps to anchor and reinforce the root zone of plants.

After the erosion-affected soils were replaced and compacted and all Secugrid® soil wrappings were confirmed as secure, rolls of Secumat® were installed on the slopes and anchored to the top of the slope.

The erosion control matting was then pinned into place using steel pins. Soil and seed were then added on top of the Secumat®.

Before the next summer season arrived, the roadway was fully open and vegetation was sprouting along the waterside slopes.

It's hard to make a roadway blend into the natural environment, but the newly greened embankments along Vilnius's beautiful Didžiulio Lake have succeeded making this revitalised, busy road pleasant to drive along.

Time crunch under the floor bridge

Advancing and sealing at the same time in the Reitersberg Tunnel

How can tunnel construction be advanced at the same time as the inner shell is being finished, when enormous amounts of material must be moved past the sensitive sealing locations? The solution: a "floor bridge." This construction is used to carry off material during tunnel advancement. The floor is built up under the bridge layer by layer. Space is limited and it requires exact timing in the execution.

The Reitersberg Tunnel will be a 2975m long section of the new high-speed railway between Nuremberg and Erfurt in Germany. The tunnel is being built near Rödental in Northern Bavaria and will cost approximately 100 million euros.

The double-shell tunnel requires sealing against pressurised water. A geosynthetic lining system is utilised here. Water must not penetrate and substances harmful to the environment must not trickle into the surrounding rock formations. The maximum water pressure is 45m above the tunnel floor. NAUE geosynthetics are being installed to form the multilayer sealing system, which consists of Carbofol® tunnel geomembrane, Carbofol® waterstops and Secutex® protection nonwoven geotextiles.

The greatest challenge of the Reitersberg project has been ensuring a flawless installation on a tight timeline. The welding of these critical waterproofing panels is a difficult operation due to the space constraints and site-specific tunnel geometry. But the geosynthetic system must be welded properly to ensure the materials provide the high level of function for which they have been engineered: a service life of at least 100 years. NAUE Sealing's deeply experienced experts have been brought in to guarantee the professional execution of the tunnel liner installation.

NAUE Sealing is a STUVA e.V.-certified professional installer. (STUVA e.V. is the research association for underground traffic installations.)

Exact timing under the floor bridge

The Reitersberg Tunnel has been opened from both sides by means of explosives and excavators. As work progresses, the rock is secured and sealed and the inner shell of reinforced concrete is installed. Allowing it all to happen efficiently is the tunnel's unique "floor bridge."

The floor bridge, a 100m long structure, allows the inner tunnel shell to be dug out under it. This is done section by section. Under the floor bridge, three sections are staged and the complex inner shell is put up in six phases:

1. Bottom road bed excavation and massive material removal under the floor bridge.
2. Securing by means of steel support arches, mesh reinforcement, and anchors and shot-crete. The latter also serves as a carrying layer for the sealing material.
3. Installation of the sealing system.
4. Reinforcement of the floor with bars and mesh.
5. Concreting the 60 to 90cm thick inner shell of reinforced concrete in the inverted arch.
6. Finishing of the full layer of the inverted arch / floor zone concrete.

As highlighted in this list, the floor area requires numerous installation steps. Each step involves coordinating workers from a variety of disciplines in tight spaces, all the while carrying off large amounts of material alongside other critical tunnel work.

This method of construction avoids a significant amount of the idle time that is normally required in tunnel construction, but it requires extraordinary cooperation and communication by the project team.

Strong planning before the project has prevented the interface problems that might otherwise have occurred, and as the project has progressed each discipline of specialist has learned more about the others—boding well for future utilisation of this construction method.

Sealing against water pressure

The geosynthetic sealing liner system being used in the Reitersberg Tunnel consists of a protection nonwoven geotextile, a geomembrane, and a geosynthetic water stop system. For both the floor and vault seals, the geomembrane is installed from a movable scaffolding, which has been tailored specifically for the geometry and work needs of the site.

The nonwoven geotextile Secutex® has a site-specific minimum mass of 900g/m². Approximately 150,000sqm have been installed. Secutex® is a needle-punched geotextile that protects the tunnel waterproofing liner from mechanical damage.

The Carbofol® tunnel geomembrane has a thickness of 3mm. The roughly 150,000sqm of geomembrane must be placed by experienced professionals because the overlapping seams must be 100% waterproof. Sealing experts and construction supervision teams test each seam for tightness by means of pressurised air. The Carbofol® tunnel liner is coated white on the side facing into the tunnel, which makes any potential installation damage more easily visible. It also allows more light to the working area, as the light reflects off the surface of the white liner. This increased visibility further helps increase the quality of the panel seaming.

External six-stud Carbofol® waterstops seal the joints of each lined tunnel section. A total of approximately 13,000 running metres of water stops are being used. In the floor zone, a second 3mm thick Carbofol® layer (as protection geomembrane) of approximately 50,000sqm have been placed above the primary sealing tunnel geomembrane.

Construction began in 2009. The tunnel breakthrough was celebrated on 21 July 2011, and the goal is to complete the inner shell by mid 2012. By 2017, the first trains will be able to use the new track. DB Netz AG is the builder responsible for this project. The joint venture ARGE Rödental-Reitersbergtunnel, consisting of the construction firms Alfred Kunz Untertagebau and Swietelsky Tunnelbau, is leading the construction.

NAUE is proud to have its products utilized in the work, and NAUE Sealing is proud to be part of the expert installation crew on site.

Exhibition and seminar schedules

15. - 17.12.11	Indian Geotechnical Conference IGC-2011	Kochi, Kerala, India
20. - 24.02.12	8th International Conference on Coastal and Port Engineering in Developing Countries, PIANC-COPEDEC VIII	Chennai, India
08. – 10.03.12	Acqua Alta Alpina	Salzburg, Austria
25. - 29.03.12	GeoCongress 2012	Oakland, California
23. - 27.04.12	Hannover Messe	Hanover, Germany
24. - 28.04.12	38th International Building Trade Fair SEEBBE	Belgrade, Serbia
02. - 05.05.12	GeoAmericas	Lima, Peru
07. - 11.05.12	IFAT 2012	Munich, Germany
31.05. - 02.06.12	12th Baltic Sea Geotechnical Conference	Rostock, Germany

Road Building over Peat in Canada

Ontario's Highway 62 runs through numerous swampy areas. Significant stretches of the road, like the province itself, overlie peaty soils. Properly maintaining roads in these areas has historically been difficult due to issues of settlement, which have led to subgrade breakdowns and roadway cracking and failures.

For a stretch of Hwy 62 south of Bancroft, the Ontario Ministry of Transportation, working with design engineering firm Golder Associates, sought a separation, reinforcement and drainage/filtration solution that would address and counter the typical problems of road building over the area's peat.

Project engineers selected Combigrid® 30/30 Q1 151-1 composite geogrids for roadway reinforcement. This unique product from NAUE is composed of not just a high-strength geogrid (Secugrid®) but a needle-punched nonwoven geotextile (Secutex®) – all in a single material.

This is the only composite product of its type in the market. Rather than installing an individual geotextile and a geogrid layer, the site crews needed only to install Combigrid®, which features the nonwoven geotextile firmly welded between the Secugrid®'s reinforcement bars. In one layer, soil stabilisation, separation and filtration/drainage is provided. For weak soils such as those with a CBR value less than 3%, the solution is ideal. This held true along Hwy 62. The selection of the multifunctional Combigrid® saved the project team time and money on installation while ensuring the long-term strength and performance desired in the project. Combigrid® allowed for a shallow excavation (to the peat depth) and easy reconstruction. The reinforcing element reduced the need for excessive aggregate and the geotextile component ensured no mixing of disparate subgrade material. Ultimately, the pavement structure was able to be constructed as thin and lightweight and economically as possible without sacrificing roadway integrity. The risk of differential settlement was dramatically reduced. Also of note: the wide Combigrid® rolls helped reduce waste on site and expedite construction. Only two rolls of product were needed to cover the entire roadway reinforcement width as well as provide a 12in. overlap for maximum assurance of coverage and long-term strength.

During construction, one lane was reinforced at a time while the other was left open to traffic. The composite geogrid rolls were unrolled in place and covered quickly to reopen the lane as soon as possible.

Roughly 10,000sqm (107,600 sq. ft.) of Combigrid® 30/30 Q1 151-1 were installed.

For Highway 62's commuters, a smoother ride has been provided, and it'll be there for a long time.

Did you know...?

In May 2011, the new, 70 MW Sălbatica II wind farm in Romania served as an interesting test site for NAUE Combigrid® 30/30 Q1 151 GRK 3. (A larger profile of the wind farm itself was featured in the July 2011 issue of NAUE News.)

Combigrid® was installed for the base course reinforcement on soft subsoils to create a stable platform for the Liebherr 750t cranes that were used to erect the wind turbines, each of which was composed of several heavy segments.

To scale the tensile strength in the grid and the loading pressure under the reinforced working platform, strain gauges were applied on the Combigrid® layer and on load-bearing measurement plates in the subsoil under the reinforcement. These tools enabled the collection of exact stress conditions in the geogrid and in the reinforced base course during different stages of the construction process.

The goal of this data collection has been to verify or optimise the performance of existing designs for the dimensioning of reinforced crane working platforms in the field.

The analyses have been elaborated on by Prof. Eng. Loretta Batali Ph.D.(Technical University of Civil Engineering, Bucharest) and a Ph.D. student. The student is steadily tracking this subject with the support of NAUE GmbH & Co. KG and BBG Bauberatung Geokunststoffe GmbH & Co. KG.

Safety for sand bunkers and ponds

Golf courses have high requirements

Sand bunkers and ponds are not the most inviting sections of a course for golfers, but for course designers, club pros and maintenance crews, these obstacles demand a great degree of care and attention. Geosynthetics play an important role in keeping these expected but unpopular hazards "in play".

Golfing has grown significantly as a global sport in the past 25 years, and this has led to many new courses being constructed. The increased number of courses has meant that many are now built atop sites with difficult soils. Bunkers and ponds present special challenges on these courses, and not just for the players.

NAUE's portfolio contains solutions that are uncomplicated, quick and easy to install. These products and systems help modern course construction meet their needs for stable, dependable play. Of note, Bentofix® geosynthetic clay liners (GCLs) provide ideal containment for ponds and Terrafix® nonwoven mats keep bunkers dry and free of stones and coarse soil.

Hydraulic engineering for bunkers

Terrafix® is a robust, permanent solution for hydraulic engineering in golf course sand traps. The nonwoven mat provides essential separation and drainage – both of which are required for reliable bunker playability. The highly engineered nonwoven component of Terrafix® allows stormwater or irrigation water to drain through to drainage channels while simultaneously serving as a durable separation layer between the subsoil and bunker. The sand used in the traps is generally of a special nature and often represents a significant investment for course managers. That sand should be protected from subsoil mixing and the humidity that the subsoil can add to the sand when water does not flow through. Terrafix® provides those key performance solutions. Course players will be especially thankful for soft, dry sand and for never encountering a stone that has mixed into the sand from the subsoil. Geosynthetic drainage and separation maximizes the performance of your trap.

The power of powder: bentonite, GCLs, and ponds

Golfers commonly lose strokes and golf balls in course ponds, but for the site owner those ponds can be the source of aesthetically unpleasant water loss and high maintenance costs. To ensure the proper function of ponds as both visually attractive (albeit challenging) hazards for golfers and active collection basins for course drainage and water management, NAUE Bentofix® geosynthetic clay liners (GCLs) provide an exceptional seal. The needle-punched GCLs are reinforced composites that combine two durable geotextile outer layers and a uniform core of high-swelling powdered sodium bentonite clay. When hydrated with fresh water, the bentonite swells and forms a low permeability gel layer that saves water in the pond. The sealing power in Bentofix® is in fact so significant that it is utilized not just for the economical sealing of golf course ponds but for engineered barrier systems with levees, reservoirs, landfill caps, and many other applications.

Additional solutions

Bunkers and ponds are not the only areas on a course in which geosynthetics are used. Special geotechnical challenges may be found with slopes or ditches, access roads, parking lots, retaining walls, etc. NAUE's complete line of geosynthetic solutions help bridge the gap between common and unique problems in course construction and successful, long-term course performance. The use of geosynthetics in new construction or restored golf courses is cost-effective and lowers the overall costs enormously.

Geosynthetics can be quick and easy to install, and they help significantly reduce the long-term maintenance (and high maintenance costs) associated with golf sites. Built with NAUE's technologies, courses drain better, ponds hold their water, and disparate soils remain separated.

Capping and Revegetating a Class II MSW Landfill in Langenlonsheim, Germany

Up until 2003, residential waste was disposed of in the municipal solid waste (MSW) landfill in the district of Langenlonsheim. With the site needing to be capped as part of waste cell closure operations, NAUE Sealing has been retained to provide single-source support. The company is delivering and installing the essential geosynthetic components: NAUE Bentofix®, Carbofol®, Secudrain® and, where the slopes are steepest, Secugrid®.

As the crow flies, this MSW site is located 1.5km southwest of the Waldlaubersheim exit of the A-61 motorway. The waste disposal organisation (Abfallwirtschaftsbetrieb AWB) of the district of Bad Kreuznach must complete the municipal waste cell capping in accordance with the regulations covering Class II landfills and recultivate the entire surface of the former landfill. A part of the measure consists of the controlled catching and draining of stormwater and leachate from the landfill mass and, in connection with the sealing, capture of landfill gases.

Above an equalisation and drainage layer, the landfill cap consists mainly of:

- NAUE Bentofix® NSP 4900 geosynthetic clay liner with the German LAGA suitability assessment.
- NAUE Carbofol® 507 2.5mm Megafriction/Megafriction high-density polyethylene (HDPE) geomembrane with BAM certification
- NAUE Secudrain® R201Z WD601Z R201Z geocomposite drainage layer with BAM certification
- Vegetation

Installed as the bottom-most layer, Bentofix® NSP 4900 is, at its core, a barrier layer of powdered sodium bentonite that swells immediately when it comes into contact with water and thereby seals against gases and liquids. The bentonite is encapsulated between two high-strength, highly durable, needle-punched geotextiles.

In accordance with the regulations for Class II landfills, MSW landfills must also have a second liner. For Langenlonsheim, the second liner consists of the 2.5mm thick HDPE Carbofol® 507 geomembrane. The surface of the membrane is textured on both sides. To expedite construction, the Carbofol® panels are welded together on-site directly after unrolling and positioning. Atop the geomembrane, NAUE Secudrain® geocomposites are installed for protection and drainage/gas venting management.

The Secudrain® R201Z WD601Z R201Z is a compound material made of filtering geotextiles that are linked to each other in a shear-proof manner and around polymeric drainage core. Landfill capping is a typical application of use for the Secudrain® line of products. The product is a protection mat, a filtering mat and a drainage mat all in one, which makes it possible to install it quickly and economically.

In sections that are steeper, the landfill embankments will be reinforced additionally with Secugrid® 80/20 R 6. The geogrid will be installed directly on Secudrain® and will secure the topsoil that is brought in.

NAUE Sealing GmbH & Co. KG's Bückeburg, Germany office received the order for the Langenlosheim site in part due to the company's extensive experience and strong reputation for installation quality. The combined service of delivering the highly engineered NAUE geosynthetics for the projects was also key in winning the project.

The overall task of sealing the 50,000sqm waste area and recultivating the surface is in the hands of the Langenlonsheim Landfill Working Group (Arbeitsgemeinschaft Deponie), which consists of the construction companies Hermanns HTI Bau GmbH & Co. KG and the Bickhardt Bau AG. The construction will take more than two years.

The geosynthetic installation on site began in September 2011.

Success vs. Sinking in Brunei

Geosynthetic separation and reinforcement materials are engineered for ground modification and improvement applications. One of the most common applications is base course stabilization in roads. As traffic loads pass over the roadway, the tensile forces can cause cracking and rutting as the pumping action induced beneath the surface causes fines and coarser aggregate to mix.

A separation geotextile prevents those aggregate layers from mixing. A reinforcement geogrid redistributes those tensile forces and interlocks with the aggregate to prevent lateral migration. In both cases, roadway service lives are extended, performance improved and standard maintenance greatly reduced.

Active roadways, however, are not the only installations that might require these functions from geosynthetics. Many construction projects themselves require separation and reinforcement geosynthetics to support the construction activities, such as when work is performed over weak soils and heavy equipment is used.

This need was exemplified by a project in Brunei. During the construction of an interchange, multiple cranes were placed on site to handle various aspects of the construction, such as bore piles and materials movement for piling and bridge construction. The area experienced heavy rains during construction operations, rains which not only delayed general site work but caused significant erosion. One of the cranes sank and toppled when it ventured too close to the unreinforced edge (see bottom picture).
When the project team investigated the sunken crane, they discovered that the reinforcement and separation geosynthetic installed beneath the staging area had not been extended far enough. Two of the primary cranes were unaffected because of the geosynthetic beneath them. The third crane was situated upon only the weak soil, and when enough soil washed out from beneath it and what remained was saturated the soil modulus became too weak to support the crane.

Shortcuts Lead to a Longer Road
Brunei's soft soils are primarily composed of sandy, silty clays with high montmorillonite content or silty, peat soils. Annual precipitation is up to 1500mm (59in.). This often requires multiple geosynthetics to enable safe, heavy construction.

For the project site that experienced the collapse of one of its cranes due to weakened soils, a unique geosynthetic had been specified. Manufactured by NAUE GmbH & Co. KG, the Combigrid® product provides both a separation geotextile and a reinforcement geogrid in a single-layer product that can simply be unrolled into position.

The needlepunched nonwoven layer is secured in the material during the manufacturing process and is sandwiched between the transverse and longitudinal high-strength geogrid monolithic bars. This allows the product to provide reinforcement, as well as filtration, separation and drainage functions.

On site, the geosynthetic-supported zone experienced some erosion, but the base modulus was held in tact by the geogrid. Water penetrating the soil was able to drain through the geotextile, which also provided separation to prevent mixing. The cranes were supported.

Where the Combigrid® had not been installed, the base course on which the crane was standing mixed with the subbase and the platform basically sunk. Also the water washed out the soil and both this caused the crane to topple.

With one storm and one photograph, we find an essential lesson about geosynthetic utilization depicted clearly. Not only can separation and reinforcement geosynthetics provide more durable and more economical roadways, but the construction process itself can be made more efficient and less subject to disruption.

The information contained herein is the best to our knowledge, true and accurate. There is no implied or expressed warranty. ©2011 by NAUE GmbH & Co. KG, Espelkamp-Fiestel, Germany · All rights reserved.
Editor: Management. Implementation: Department for Marketing. Circulation: 2000, Design/Production: TwoTypes². Bahnhofstr. 14, 32312 Lübbecke, Germany. Reproduction, including extracts, may only be made with the prior permission of the publisher.