



The latest news magazine from the NAUE Group

Issue 29 – November 2006

Foreword

2006 is now coming to an end and it is once again time not only to look back and summarize but to look forward into 2007.

2006 was a year of success for geosynthetics. We are pleased to report that, in addition to good business in the export sector, the number of construction projects in Germany noticeably increased. Helped along by extremely favorable weather conditions, the number of projects on the German market made for lively activity in the construction sector for which we extend particular words of praise for our installation subsidiary NAUE Sealing (NSL). In 2006, NSL began major reorganization measures. In the NAUE News 26, we reported that due to cost pressure, NSL was having to be centralized at the Bückeberg location. The majority of the workforce supported and agreed to this step and, in some cases, willingly took on an extra workload. The news, therefore that NSL succeeded in generating a distinctly higher turnover in 2006 is more than pleasing, and we are optimistic that NSL will continue this successful path in 2007 under the management of Dipl.-Ing. Kai-Christian Ledel.

Seen internationally, geosynthetics continue to make advancements no matter whether in so-called "developing countries",

in the booming oil states or in the rapidly growing Asian countries. Everywhere, people are beginning to realize that without measures to protect water and the environment and

without a functioning infrastructure, the potential for developments in these countries is limited and therefore people are investing heavily in environmental protection and infrastructure.

The geosynthetic industry with its range of products can contribute greatly to cost effective implementation of essential construction measures. Therefore there is every reason to look optimistically to the future for the development of the geosynthetics market. As we reported in the NAUE News 28, the summer of 2006 saw the start-up of the new production in Adorf of the third Secugrid® production line and a

ted a highly modern industrial location in Adorf in Vogtland.

We will be holding our fifth German Geosynthetics Congress on January 25 and 26, 2007. We are looking forward to interesting discussions with reputable speakers on the topics of hydraulic engineering, infrastructure, landfills and railway engineering. This time, we have chosen Bad Lauterberg in the Harz Mountains as the venue for our event and, to judge by the responses, we have already received, we can expect a good number of participants.



The NAUE location in Adorf/Vogtland.

We would like to extend a special "thank you" to all of our employees who through their commitment – which more than often exceeded the usual – made this year such a successful one for the NAUE Group.

Our thanks also go to our customers and partners abroad and in Germany for their trust and the pleasant business cooperation.

second bar extruder. Furthermore, modern offices and a new laboratory for quality assurance were built for this location. The old office buildings were demolished to make room for an additional parking lot. The new appearance now demonstrates publicly that we have crea-

The NAUE group wishes all of our readers a joyful and peaceful Christmas and a happy New Year.



Largest Bentofix® Mining Job

Construction of a composite cover soil system which includes a Bentofix® Thermal Lock Geosynthetic Clay Liner (GCL) started on November 2, 2006 with an initial deployment of 10,000 m² on day 1 of the project. Terrafix Canada (a NAUE Bentofix® partner) along with the general contractor, Hazco Environmental & Decommissioning Services, plan to deploy 120,000 m² this year prior to closing the project down for the winter. Construction will resume in the Spring to complete this 800,000 m² soil cover system for the Ontario Ministry of Northern Development and Mines at the abandoned Kam Kotia Mine Site located in northeastern Ontario, Canada. The soil cover would effectively impede the entry of water and oxygen into the high sulphide tailings, substantially reducing acid generation and metal leaching effects from within the tailings. ■



National Projects

Renovation of a flood barrier on the River Rhine [Jürgen Witte]

As part of a general plan for flood protection on the Rhine in the area of Rheinhausen, four kilometres of flood barrier were renovated, whereby the cross-section of the levee was reinforced and raised. To prevent percolation in the event of flooding, a Bentofix® B4000 geosynthetic clay liner (GCL), needle-punched across the entire surface, was installed as a sealing measure on the water side. Five hundred and eighty Bentofix® rolls, pre-fabricated to single lengths of 6.50 m to 13.20 m were rapidly and efficiently installed. As the Bentofix® edges had already been bentonite impregnated in the manufacturing plant there was no need to add bentonite into the overlapping areas on site. The Bentofix® GCL was covered with 800 mm of gravelly sand and a 200 mm layer of topsoil. As a basic principle, all trees and bushes should be removed from at least 10 m away from the base of the levee to prevent root penetration in the



Installation of geosynthetic clay liner Bentofix®

downstream load filter or in the body of the levees itself. As this was not the case for this construction project, the tender demanded that a vertical arranged, at least 2 mm thick geomembrane be installed 2.6 m behind the load filter as a protection against root penetration and rodents. A 2 mm (80 mil) HDPE Carbofol® liner was installed.

Although the Bentofix® GCL represents the main means of sealing in the event of flooding, the load filter on the downstream embankment of the levee contributes to increasing stability and, in case the levee is flooded, it reduces the seepage line, thereby containing the water flooding through the levee fill in the downstream filter area. The use of mechanically reinforced Secutex® 251 GRK 4 nonwoven geotextiles prevents long-term internal erosion which would severely limit the stability of the construction. This is effected by three-dimensional, labyrinth-type pore channels, which imitate the soil structure and thus ensure the filter stability of the Secutex® nonwoven geotextiles. The renovation measures were commissioned by the Regional Board Freiburg, Environmental Department, Unit 53.3 and involved the installation of 20,000 m² of Bentofix®, 7,000 m² of Carbofol® and 15,000 m² of Secutex®. Planning and construction site management lay with the Raupach + Stangwald consultant in Schallstadt and the construction work was carried out by Kirchhoff + Schleith GmbH & Co. The geosynthetics were installed by Ludwig Kunststoffgroßhandel oHG. ■

Geosynthetic sealing for a reservoir for artificial snow [Ralph Werner]

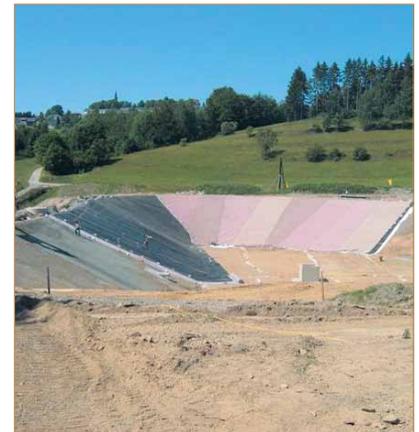
A new ski swing has been created right next to the popular recreation park "Hohe Reuth", Adorf, Germany, in time for the 2006/2007 ski season. The length of the south slope has been increased and now has a chair lift to take four persons directly to the hotel "Hohe Reuth." The northern slope was fitted out with a cable lift for two persons. Both lifts are directly linked up with the lift station in the valley. And to make sure there is enough snow right through to warmer days, both slopes can be covered with artificial snow in future.

In order to have a sufficient supply of water for whenever artificial snow is required, a basin, able to hold more than 20,000 m³, has been integrated into the landscape. The basin is con-

tinually fed from a stream. The volume of water can be controlled and as soon as the maximum level is reached in the basin, the culvert from the stream can be closed.

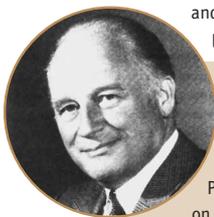
To prevent water loss and stability problems in the area of the basin, and uncontrollable changes in the ground water balance, a highly effective, economic geosynthetic sealing system was selected.

More than 7,000 m² of Carbofol® MegaFriction, 2.0 mm (80 mil) thick and well-protected on both sides with our nonwoven Secutex® R804 and Secutex® R404, made in our new NAUE facility in Adorf, were used to provide strong and durable layers. As the sealing system is relatively thin, ground movements in a sensitive environment are minimized and the capacity of the basin optimized. The basin was built by the construction company VOBA Hammerbrücke, supported by AKW Umwelttechnik Grünhain, installation specialists. The sealing work was carried out in June and July 2006.



Installing the sealing system with Carbofol® and Secutex®

On September 16, 2006 "Skiwelt Schöneck" was presented to the public during an Open Day. We are looking forward to lots of snow this winter and wish the venue situated not far from our location in Adorf the very best of success! ■



Professor Zitscher - 85th birthday!

The retired head of the Department for Water Supply and Distribution, Irrigation, Drainage, Hydraulics and Coastal Protection in the Ministry for Food, Agriculture and Forestry in the State of Schleswig-Holstein Professor Dr.-Ing. Fritz-Ferdinand Zitscher celebrated his 85th birthday on November 17, 2006.

Besides his many tasks and duties in the Ministry for Food, Agriculture and Forestry in the State of Schleswig-Holstein, Professor Zitscher's pioneering work with geosynthetics and asphalt for hydraulic engineering and coastal protection systems is more than worthy of recognition as it has paved the way to many sustainable developments.

Professor Zitscher's courage towards innovation and his rich experience have been reflected in recommendations and numerous publications. In the meantime, his pioneering activities are yielding excellent results. Increased levee safety, reliable sealing elements in environmental protection measures, improved performance of geotechnical structures of roads and railways demonstrate the rapidly increasing application of geosynthetics in geotechnics - the century of geosynthetics has only just begun!

Being a pioneer for today's global developments must surely fill Professor Zitscher with both pride and joy. We - the NAUE company - have also benefited from his knowledge and experience. Our shareholders and employees extend warm birthday greetings to Professor Zitscher and wish his dear wife speedy recovery and many more happy years together. ■



International Projects

Sozopol Landfill [Armin Leue]

Since 1992, the Republic of Bulgaria has been implementing a plan to improve the disposal of waste. The Waste Law of 1975 was revised in 2000. Funded by the EU and ISPA, the order was placed in 2001 to build six regional landfill sites.



Carbofol® KDB installed as base sealing system

The Ministry for the Environment commissioned the planning and construction of the Sozopol Landfill in 2003, with a modern drainage system and leachate treatment plant, in compliance with current international directives. The COWI company from Denmark was responsible for the planning and construction supervision in the hands of the consortium AEW/Fichtner, Germany. Construction work was carried out by the consortium Heilit/ Wörner, Germany, Stanilov and Star.

The base liner in the landfill comprises a 1 m thick, cement-stabilized mineral liner installed in 4 layers, each 250 mm thick. Then a 2.0 mm (80 mil) thick Carbofol® HDPE geomembrane was installed on top of this base layer, followed by a nonwoven geotextile Scutex® R 901a, to provide a protection layer against load from the 300 mm thick 16/32 mm leachate collection

gravel. NAUE GmbH & Co KG was commissioned to supply and coordinate the installation of the geosynthetics for the base sealing.

By installing a sealing system made of NAUE geosynthetics, the operator selected a technically sound and durable solution. The idea of "one-stop shopping" which includes everything from a technical advisory service, supply of all geosynthetic elements right through to their installation meant that the construction's owner was able to place the landfill in operation right on schedule and save considerable costs compared to conventional means of construction. Another advantage was that the coordination of geosynthetics on site required just one contact partner - NAUE.

Nitrokémia Landfill

[Sándor Romencsák]

Investigations of industrial waste between 1960 and 2001 on the premises of the incineration plant at Nitrokémia Rt. in Balatonfüzö revealed that it contained a large amount of problem waste.

The comprehensive environmental survey showed a potential hazard to the environment, which required measures to prevent any contamination of the ground water. The general execution of these measures was carried out by a consortium under the leadership of LOKO-WASH Kft. in accordance with by GEOHIDROTERV Kft., which planned to distribute the final disposal of the waste over two local landfills with capacities of 390,000 m³ and 376,000 m³. The required basis sealing system was planned and built as follows: (Table 1).

After intermediate storage the total volume of waste was placed in the newly constructed

areas where it was additionally compacted to increase storage capacity. On completion of filling, the surface of the landfill was capped (total construction Table 2).

To ensure a durable sealing system, the owner decided on a combined sealing system made of Bentofix® geosynthetic clay liner and a Carbofol® geomembrane MegaFriction (2.5 mm (100 mil) thick). The distinctive structure of MegaFriction provides long-term embankment stability - validated by various tests results. Instead of the originally planned 500 mm thick compacted clay liner (water permeability $k < 10^{-9}$ m/s), a geosynthetic clay liner Bentofix® NSP 4900 - which is approved at least as an equivalent alternative - was installed.

The planned mineral drainage layer was replaced by a geosynthetic drainage system Secudrain® 201 WD601 201 on the geomembrane Carbofol®. Secudrain® also acts as a protection layer against the top soil.

Tab. 1

- Waste
- 200 g/m² separation layer
- 500 mm leachate collection system
- 1,000 g/m² Scutex® protection layer
- 2.5 mm HDPE Carbofol® geomembrane
- 1,000 g/m² Scutex® protection layer
- Geophysical monitoring system
- 500 mm leachate collection system (embankment area: geosynthetic drainage Secudrain® XX8)
- 1,000 g/m² Scutex® protection layer
- 2.5 mm HDPE Carbofol® synthetic liner
- Geosynthetic clay liner Bentofix® NSP 4900
- 500 mm compacted clay liner

Tab. 2

- 200 mm topsoil
- 800 mm cover soil
- Geosynthetic drainage system Secudrain® 201 WD601 201
- Carbofol® MegaFriction
- Geophysical monitoring system
- Geosynthetic clay liner Bentofix® NSP 4900
- 300 mm leveling layer
- Waste



The basis sealing comprising Carbofol® KDB installed over GTD Bentofix®

Compared with the original plan using mineral components, the installation of NAUE geosynthetics meant enormous cost savings as well as shorter installation time so that this effective environmental protection was implemented months earlier than scheduled at a long-term higher engineering level. ■

Prof. Dr.-Ing. Fokke Saathoff takes up appointment at University of Rostock

We are proud to announce that as of September 1, Dr.-Ing. Fokke Saathoff has accepted the offer of the University of Rostock and has taken up a position as university professor for the management of rural civil engineering structures. Professor Saathoff began his career with NAUE in 1991 as a construction engineer in the department for applications engineering and development.



Just a short time later, he was additionally entrusted with public relations, quality assurance, standardization work, and patents. In 1992, Professor Saathoff was assigned with power of attorney. On January 1, 1998 he was appointed managing director of the newly founded engineering office Bauberatung Geokunststoffe GmbH & Co. KG (BBG). In addition to his management activities, Professor Saathoff was and is still a member of several technical committees and working groups. He holds the position of chairman in the AK 5.1 of the DGGT, vice-chairman in the DIN committee for geosynthetics and in this position, the German delegate for European Standardization in CENTC189/WG1. Moreover, Professor Saathoff is the author of many technical publications. NAUE would like to extend their gratitude for his work in the past 15 years and hope that Professor Saathoff will still find time in addition to his professorship to give the world of geosynthetics, and thus NAUE, the benefits of and access to his wide range of experience and knowledge. ■



Interface transmissivity between Bentofix® and geomembranes [Kent von Maubeuge]

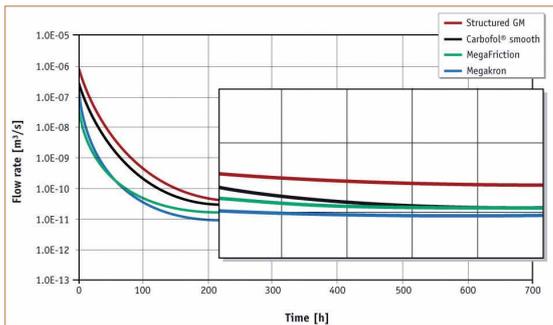
Extending the experimental work carried out in 2005 for studying the influence of the texture on the Geomembrane/Geosynthetic Clay Liner (GM/GCL) interface transmissivity, the structured Carbofol® MegaFriction from NAUE was tested against Bentofix® NSP 4900. The intention of these tests were to investigate the flow

The test performed in LNEC, started with the GCL at an initial water content equal to 13.3 %. In Cemagref, the test began after a two weeks period of prehydration of the GCL in the test cell under load. The reason for using different initial water contents at LNEC and at Cemagref is related with the possible situation in field where a puncturing of the GM could occur during the installation phase, where the GCL is more likely unhydrated or where a puncture could occur later when the GCL is fully hydrated.

The final flow (after 600 hours) rates achieved were in the range of 1.1×10^{-11} and 9.3×10^{-12} m³/s.

Comparing all structured geomembranes against each other the following flow rates (after 600 hours) were achieved:

Sprayed on structure	1.7×10^{-11} m ³ /s
Carbofol® MegaFriction	8.6×10^{-12} m ³ /s
Carbofol® Megakron	7.5×10^{-12} m ³ /s



As expected the flow rates in both testing facilities at the beginning of the test differ from each other due to different moisture contents of the Bentofix® GCL. However, the final flow rates calculated on a 24 hours basis (1.4×10^{-11} - 9.3×10^{-12} m³/s)

These tests prove once again that the intimate contact surface geomembrane versus GCL is fully efficient even with textured surfaces and fulfil the function of a reduced spreading of liquid under a damaged area of a geomembrane with the use of a Bentofix® GCL. Therefore the concept of having a secondary lining system under a geomembrane increases the safety of the capping or base lining system. Earlier publications already compared the transmissivity rate between different GCLs and geomembranes and compared these with the flow rates between a geomembrane and a compacted clay liner. The conclusion then was that the GCL outperformed the compacted clay liner. With these tests it was now proven that this statement is still correct, even with textured geomembranes.

rate through a hole punched into the geomembrane and to measure the lateral transmissivity between the geomembrane and the GCL. The results were then compared to the previous tested NAUE structure Megakron and a sprayed on structure.

obtained after about 600h are similar in both laboratories.

The MegaFriction results in this test were compared with the results with a smooth Carbofol® GM obtained by Barroso (2005) under the same testing conditions. An interesting fact is that there is a discrepancy in the flow rates at the beginning of the tests, with the smooth GM presenting higher flow rates than the MegaFriction. The MegaFriction surface seems to reduce the space available at the interface for the water flow. However, with time the bentonite in the GCL swells and creates an intimate contact between the GCL and the geomem-

Barroso, M. C. P. (2005). "Fluid Migration through Geomembrane Seams and through the Interface between Geomembrane and Geosynthetic Clay Liner", Ph.D. thesis/, Universities of Grenoble and Coimbra, France and Portugal, 215 p. ■

The tests were conducted in LNEC, Portugal and Cemagref, France. A Bentofix® NSP 4900 needle-punched GCL was directly beneath the geomembrane and the subgrade of the GCL was a clayey soil. The tests were conducted under a hydraulic head equal to 0.3 m and a confining stress equal to 50 kPa. The diameter of the hole in the geomembrane was 3 mm.

Have you heard? ...

The TV channel 3sat broadcast a 30-minute report on the subject of Terrafix® sand containers and their role in the construction of an artificial surf reef off the coast of New Zealand. The documentary was entitled "Breakwaters" and showed in detail the application of NAUE nonwovens in the field of coastal protection and in artificial surf reefs! If you are interested in product information or a showing of the documentary film, just send us an email referring to Terrafix® Sandcontainer to info@naue.com ■

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Exhibition and Seminar Schedules

November

November 28-30, 2006
November 28 to Dec. 1, 2006

Civils 2006, London, United Kingdom
Pollutec 2006 Int. Exhibition of Environmental Equipment of
Environmental, Technology and Services, Lyon, France

December

December 6-7, 2006

Practice Conference and Exhibition Landfills 2006,
Hanover, Germany

December 6-8, 2006

Seminar: Geosynthetics in Mining and Waste Management,
Perth, Australia

December 17-19, 2006

Offshore Arabia 2006, Dubai, UAE

2007

January

January 4-5, 2007

37. International Hydraulics Engineering Symposium
Aix-la-Chapelle (IWASA), Germany

January 16-19, 2007

Geosynthetics 2007, Geo Solutions for the Environment,
Transportation and Homeland Security, Washington, USA

January 25-26, 2007

5. Geosynthetics Colloquium, Bad Lauterberg, Germany

February

February 1-2, 2007

23. Symposium "Safe Landfills", Süddeutsches
Kunststoffzentrum Würzburg, Germany

February 2, 2007

VSVI Seminar Geosynthetics in earthworks, new
developments and site reports, Münster, Germany

February 6-8, 2007

12th Mining Indaba Conference 2007, Cape Town, South Africa

February 15, 2007

FS-KGEO 2007, Munich, Germany

February 22-23, 2007

3. Leipzig Symposium on Landfills, Leipzig, Germany

March

March 5-8, 2007

TerraTec Leipzig, Leipzig, Germany