



Geotechnik mit Geokunststoffen

geotechnics with geosynthetics



The NAUE group is one of the market leaders in the manufacturing of modern geosynthetics and operates worldwide.

NAUE Dialogue

Communication in the design stage of your project helps make your planning more effective, your calculations more economical, your risks minimal and your solutions durable.

NAUE Know-How

As a worldwide market leader in the development and manufacture of geosynthetics, we have the experience you need.

NAUE Service

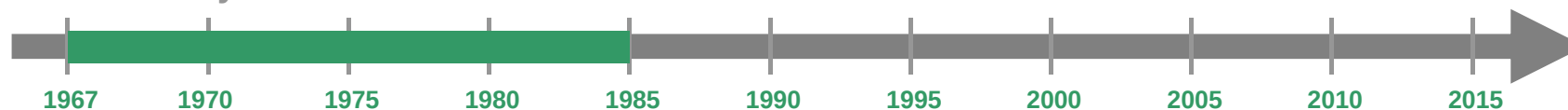
Engineering, manufacturing, installation. We fulfil your needs with custom-made solutions. Use us as your advisor and partner.

We started at the „Midlandcanal“



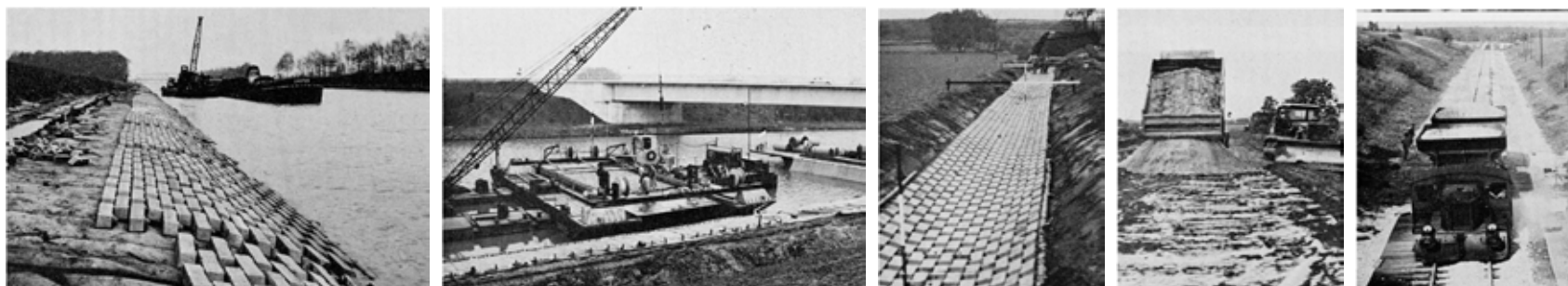
Accepted embankments are no match for shipping traffic with modern cargo ships.

NAUE History



1967

First use of Terrafix® nonwoven geotextile in an hydraulic engineering application.



Installation 1969

1968

Development of Carbofol® geomembranes by Niederberg Chemie.

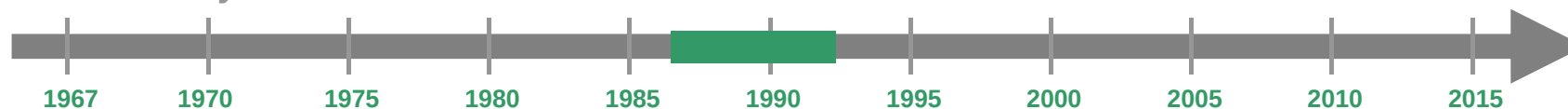
1984

NAUE Fasertechnik (fibre technology) GmbH & Co. KG is founded.

1985

Depotex® HDPE geotextile nonwoven developed for the use in a landfill applications.

NAUE History



1987

The geosynthetic clay liner (GCL) Bentofix® is invented and patented.



First production trials



Bentofix®

1989

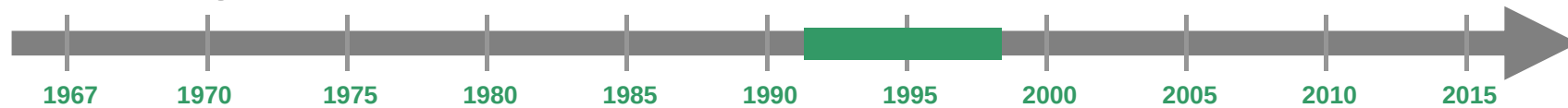
Acquisition of the production line for Secudrain® and Secumat® from Oltmanns GmbH.

1992

Bentofix® GCLs are introduced into Canada and USA.



NAUE History



1993

The installation company NAUE Sealing GmbH & Co. KG for landfill sealing systems is founded.

1994

NAUE Fasertechnik GmbH & Co. KG is certified according to ISO 9001.

1995

Bentofix® GCLs and Terrafix Soft Rock® are introduced into Australia.

1996

Acquisition of the Carbofol® production lines from itb “Isolierungsgesellschaft für Tunnel und Bauwerke, Tönisberg” (Sealing company for tunnel and structures).

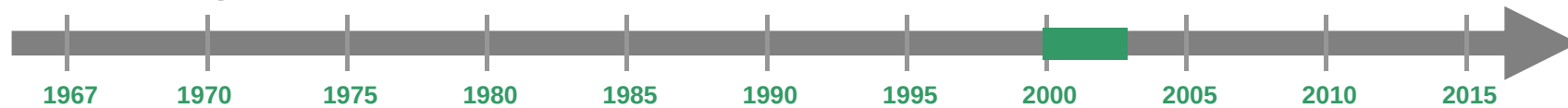
1998

Founding of the geosynthetic consulting specialist company “Bauberatung Geokunststoffe GmbH & Co. KG”.

1998

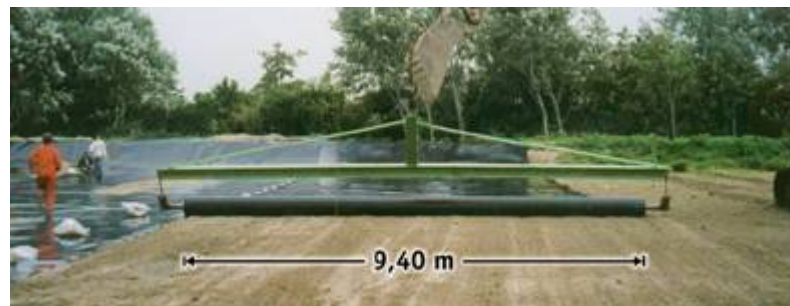
Completion of the geosynthetic portfolio with Secugrid® geogrids.

NAUE History



2000

Production of the world wide widest (9.40m) flat sheet extruded Carbofol® geomembranes.



2002

Realisation of CE marking for geotextiles and geogrids.

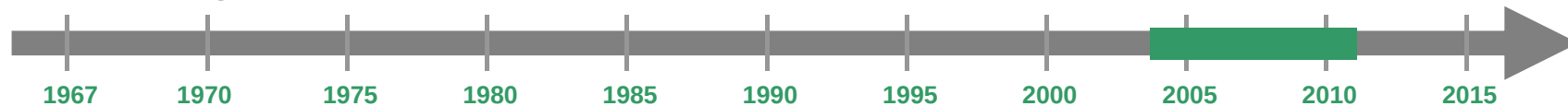
2003

Optimisation of the production technology which firmly connects Secutex® nonwovens between the Secugrid® bars to Combigrig®.

2003

Founding of the joint venture Anchor Lining Systems in South Africa for production and sales of HDPE concrete protection liners.

NAUE History



2004

Secudrain® drainage mats are produced in 3.80m width with a new Secutex® bonding technology over the entire drainage core surface for higher flow rates.

2005

The name NAUE Fasertechnik GmbH & Co. KG changes to NAUE GmbH & Co. KG.

2006

The 3rd Secugrid® geogrid production line is put into operation. CE marking for geosynthetic barriers is implemented.

2008

NAUE America, Inc. is founded.

2009

Commissioning of the new warehouse and logistics centre (corporate headquarter in Fiestel).

2010

Polyolefin coated Bentofix® GCLs added to the product range.

2011

Founding of NAUE Asia Sdn. Bhd.; production opening of Bentofix® plant, Selangor, Malaysia.

100 %
subsidiaries abroad

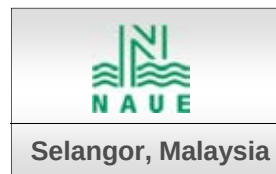
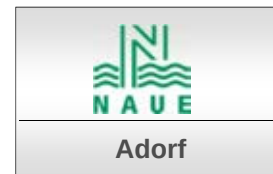
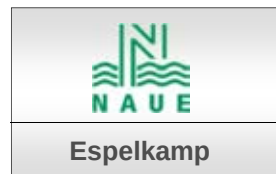
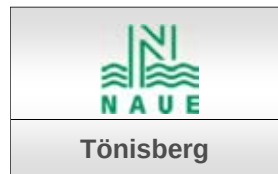


NAUE group 2013

Headquarters



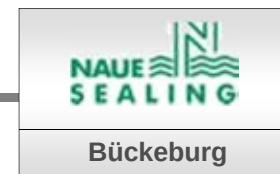
Production plants



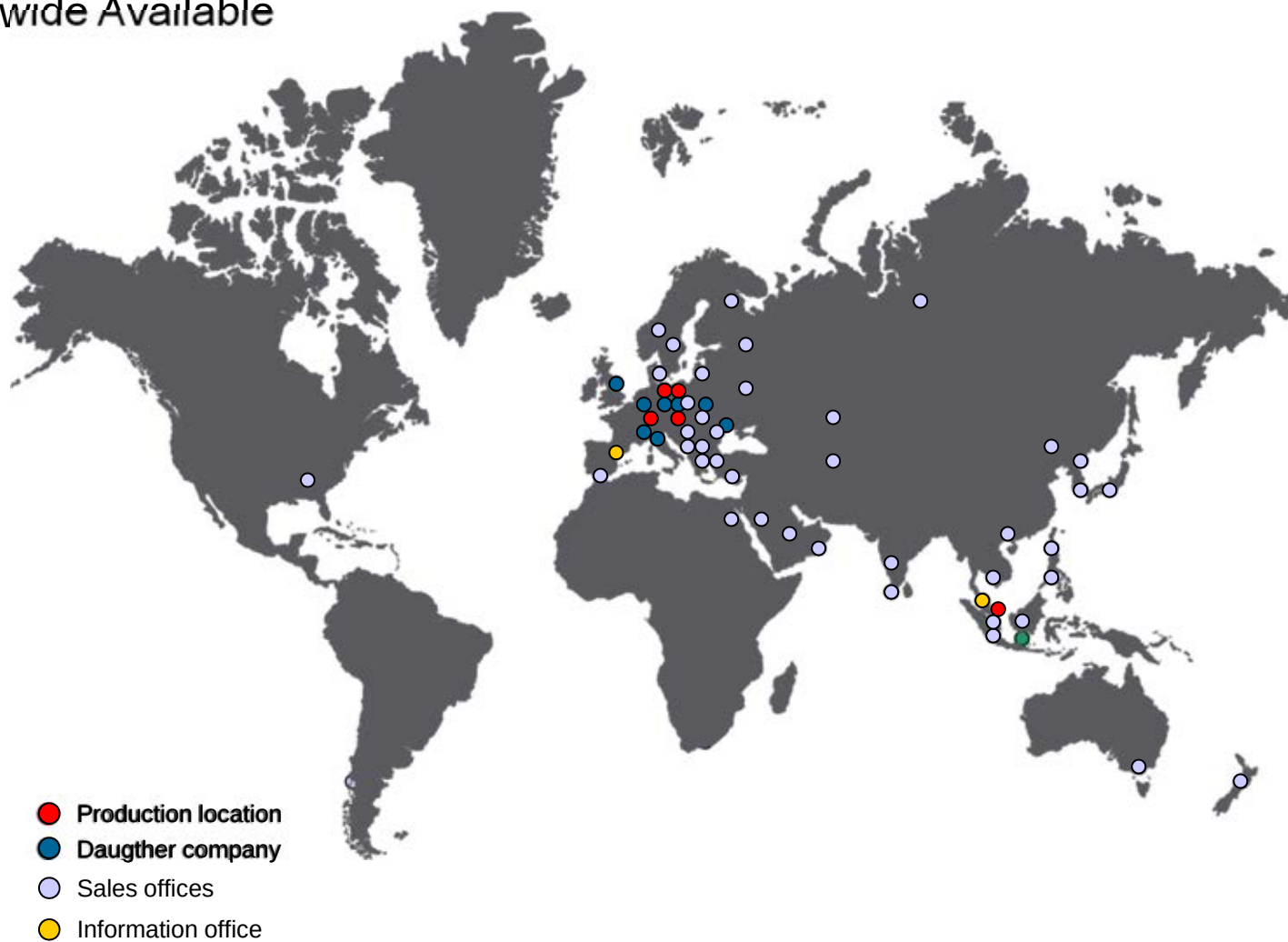
100 %
subsidiaries abroad



100%
national subsidiaries



Worldwide Available



Five Production Locations



Espelkamp-Fiestel



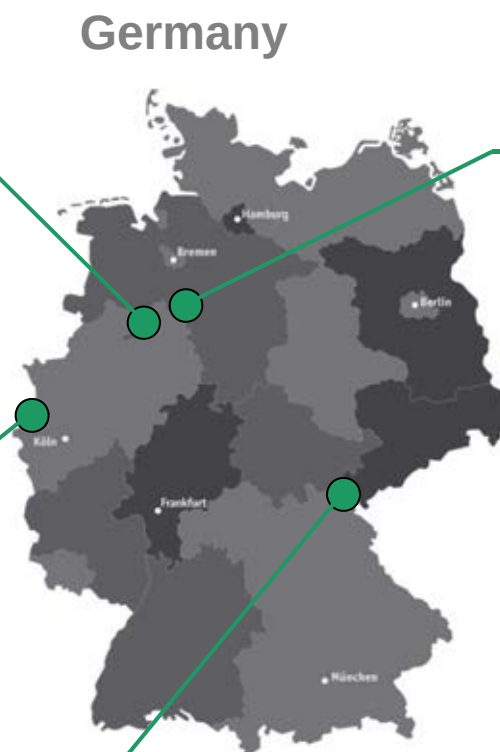
Bückeburg



Tönisberg



Adorf



Selangor

Production Location **Espelkamp-Fiestel 1969**



An affiliate of E.A.H. Naue KG is founded for the production of geotextiles for hydraulic engineering applications



Production Location **Espelkamp-Fiestel**



Corporate headquarter NAUE GmbH & Co. KG

Production for

- Secutex® nonwoven geotextiles
- Terrafix® nonwoven geotextiles
- Bentofix® geosynthetic clay liners

Production location since 1969

Laboratory for quality control

The administration building in Fiestel since 2005



Production Location **Adorf**



Production location for

- Secugrid® and Combigrid® geogrids
- Secudrain® drainage systems
- Secumat® erosion control mats
- Secutex® nonwoven geotextiles

Laboratory for quality control

Production Location **Tönisberg**



Production location for

- Carbofol® smooth and MegaFriction geomembranes

Laboratory for quality control

Production/Installer Location **Bückeburg**



Project-specific preparation (cutting) location for

- Carbofol® geomembranes

Geomembranes panels are prepared according to project drawings

Production Location **Selangor**

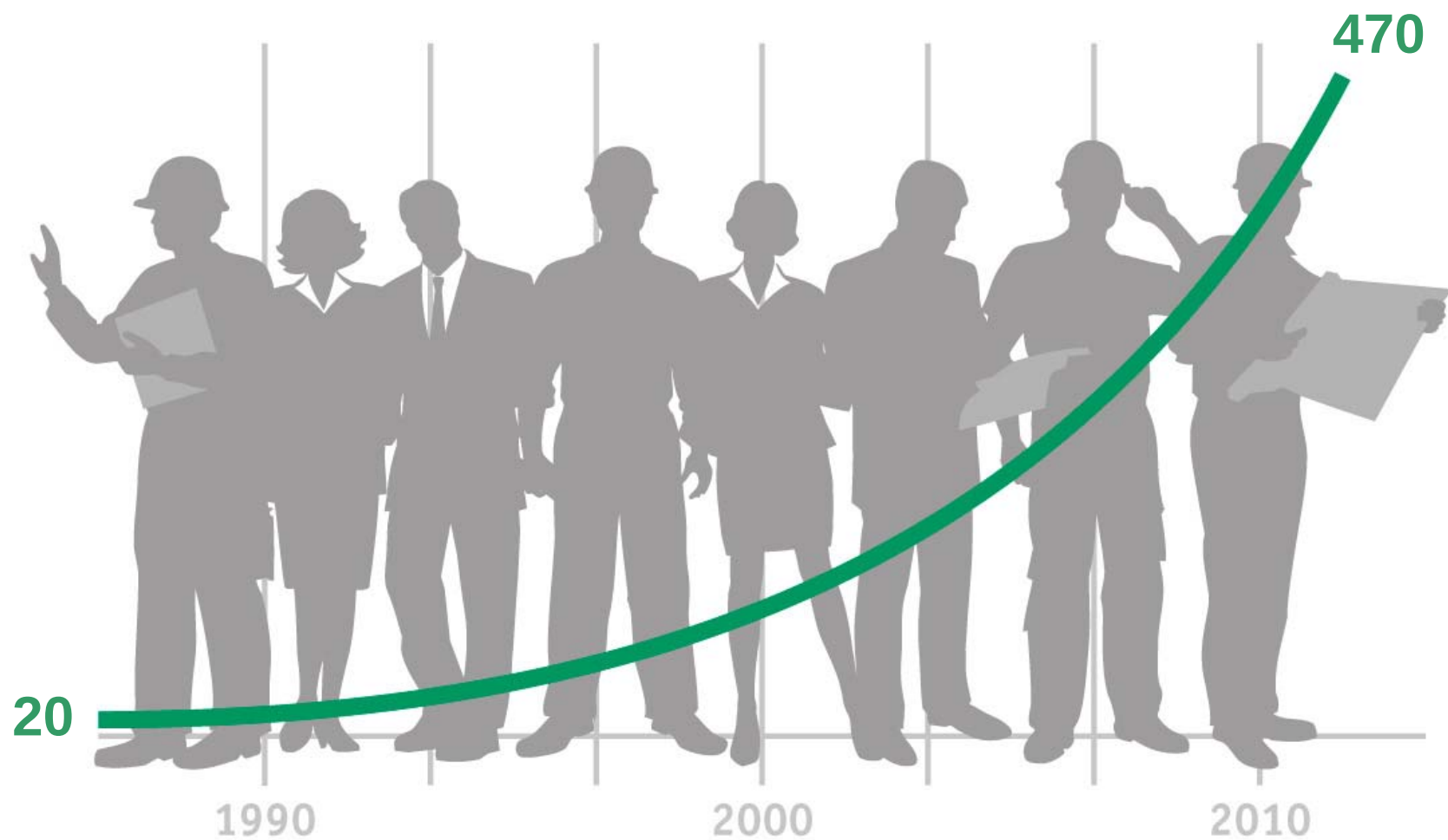


Production location for

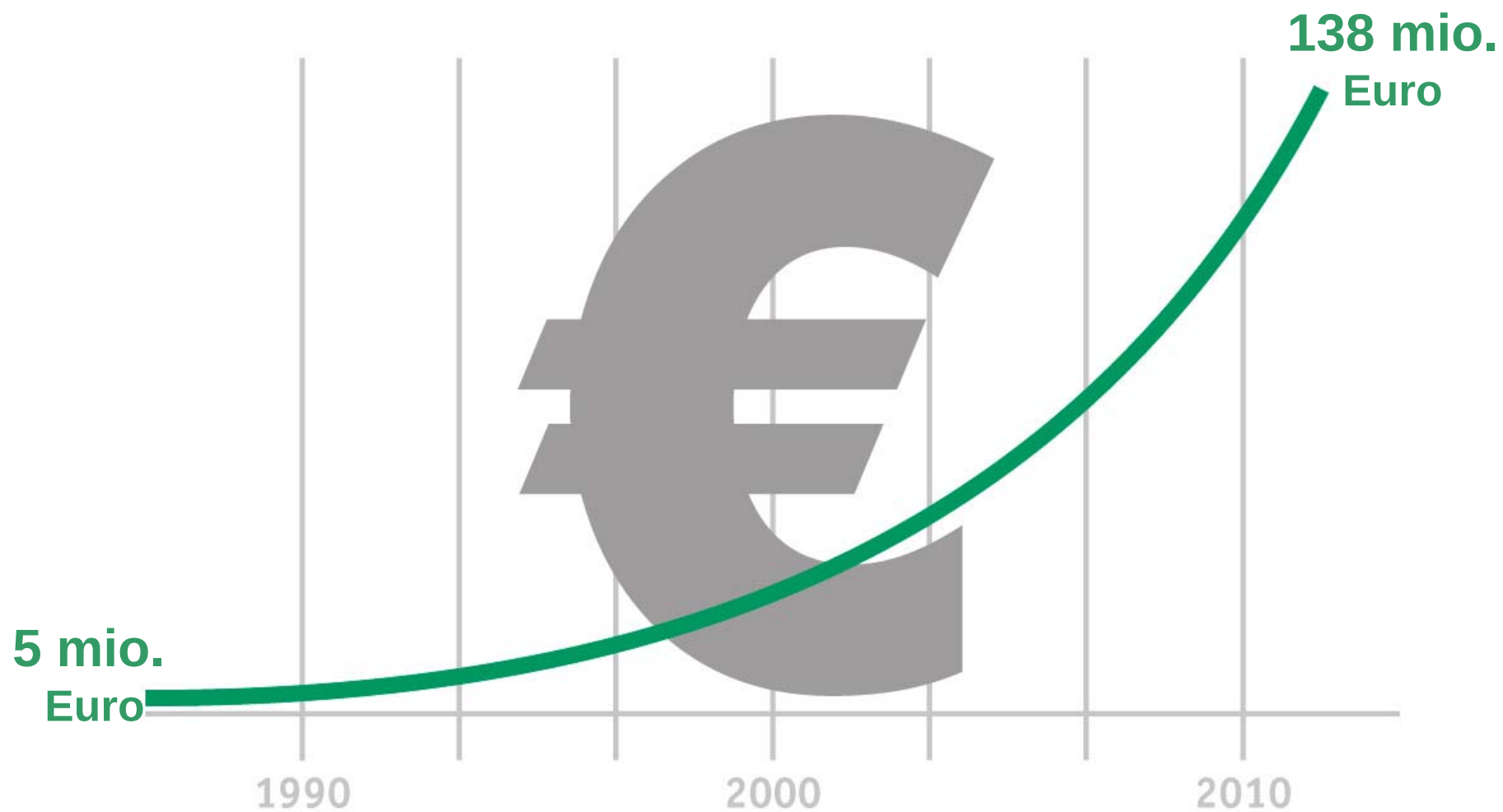
-Bentofix® geosynthetic clay liners

Laboratory for quality control

NAUE Employees (1984 – 2013)



NAUE Sales (1984 – 2012)

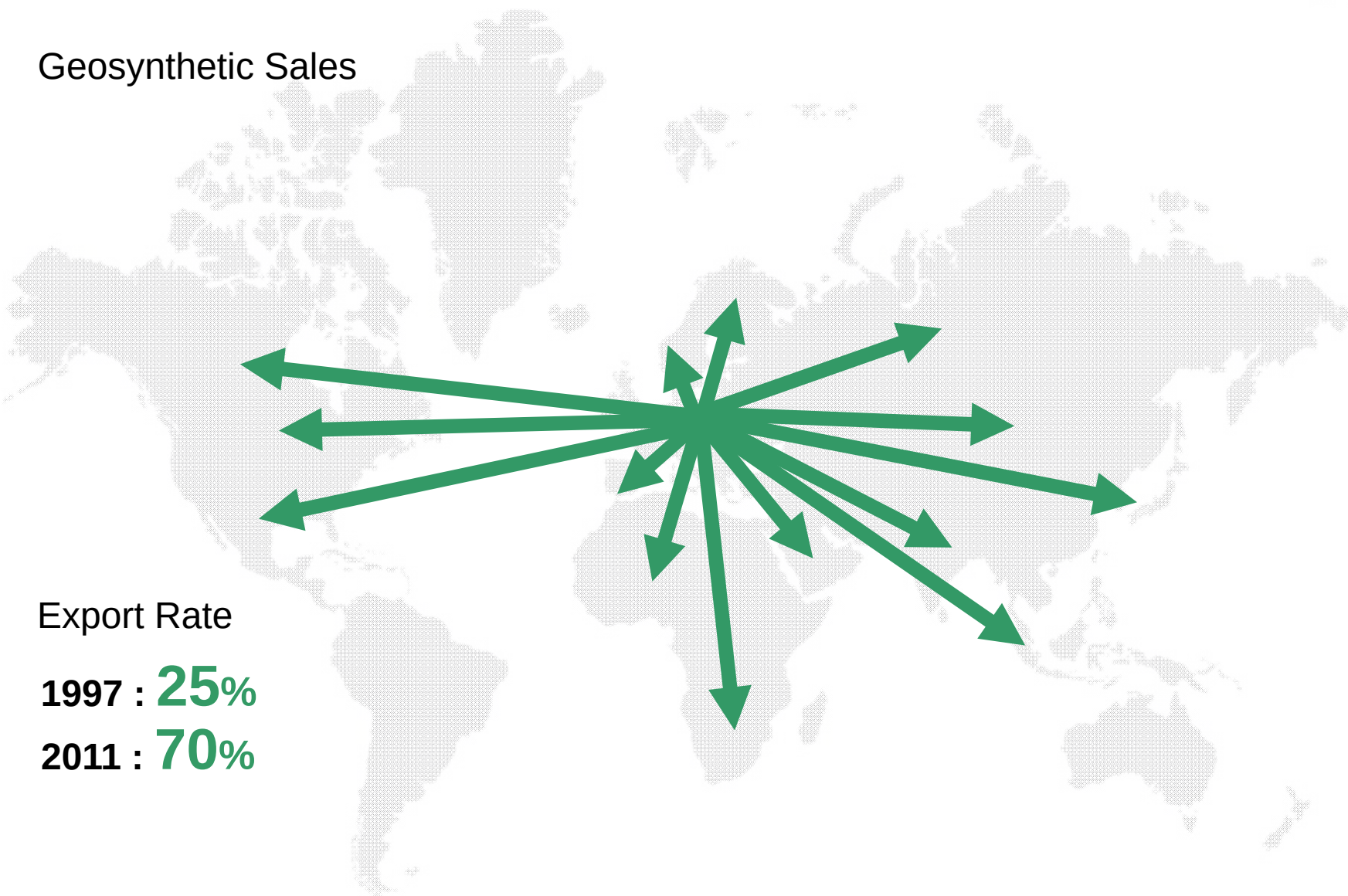


Geosynthetic Sales

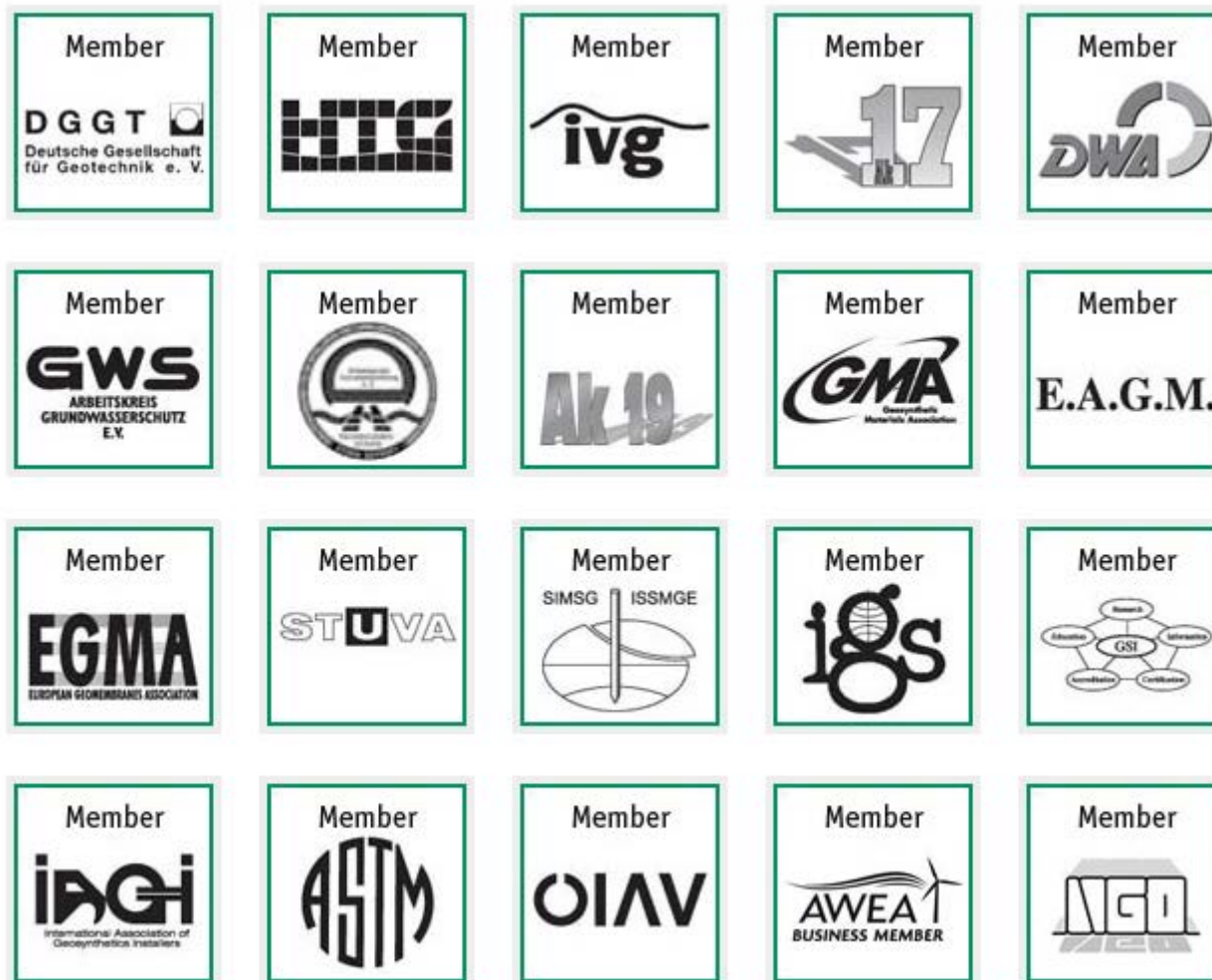
Export Rate

1997 : **25%**

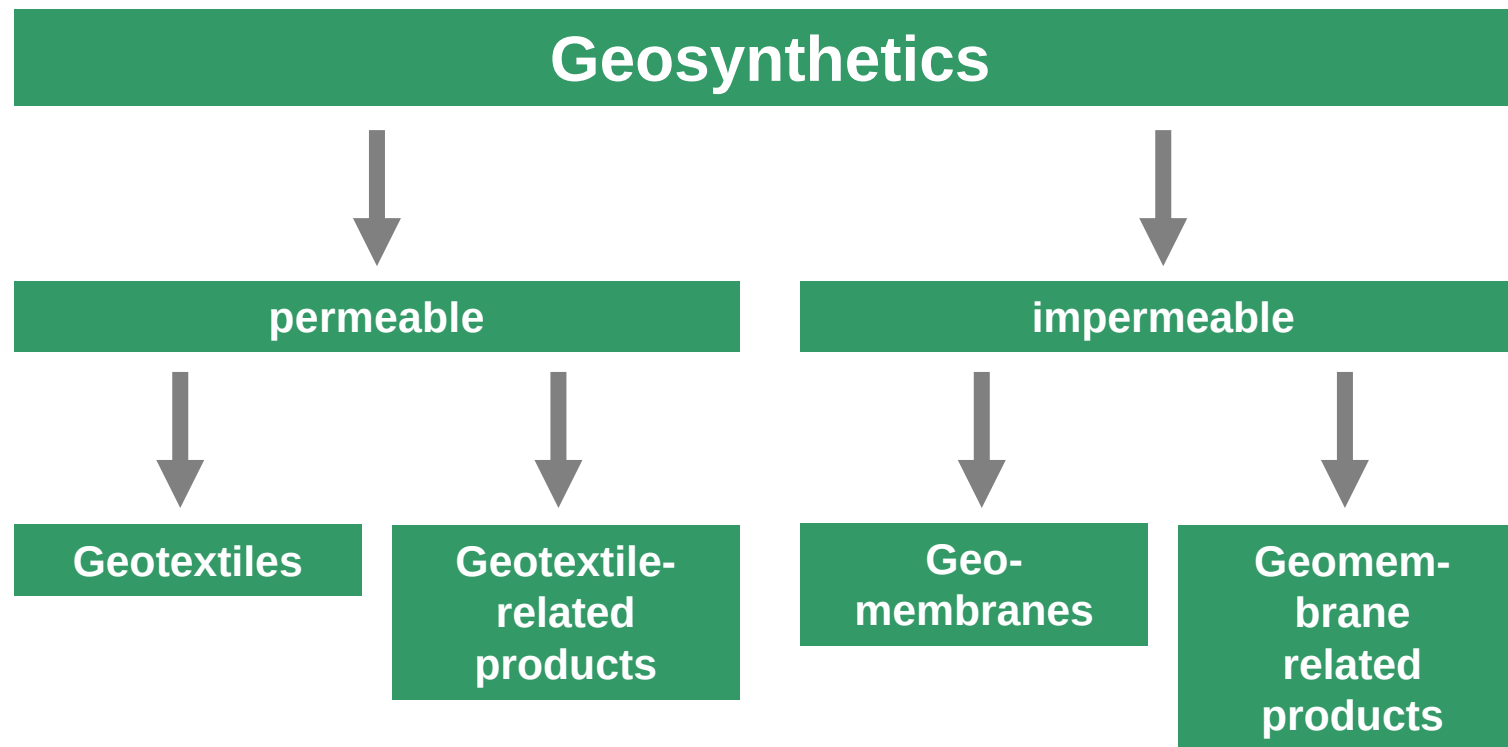
2011 : **70%**



Memberships

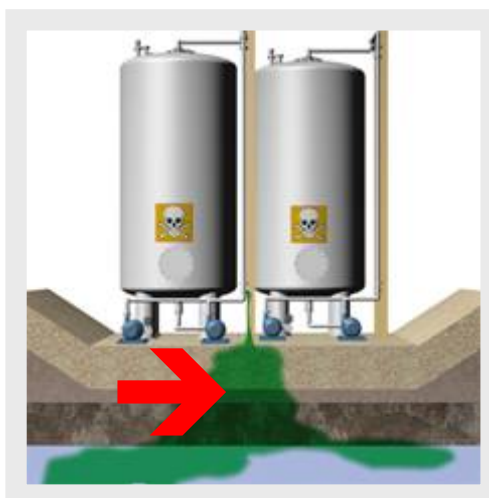
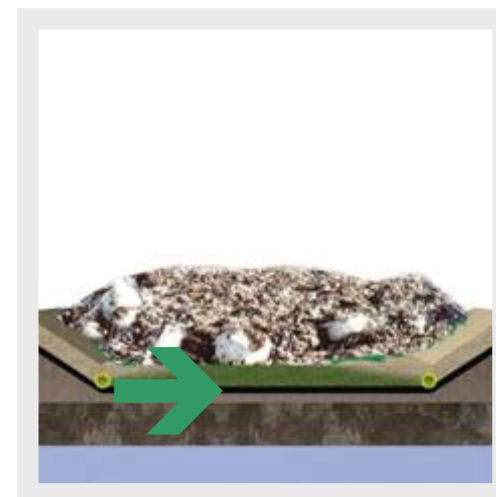
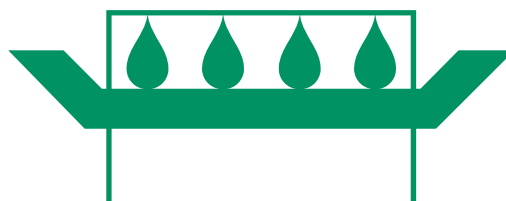


Geosynthetics



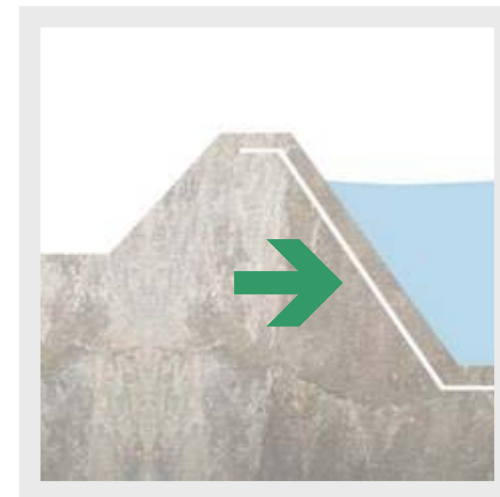
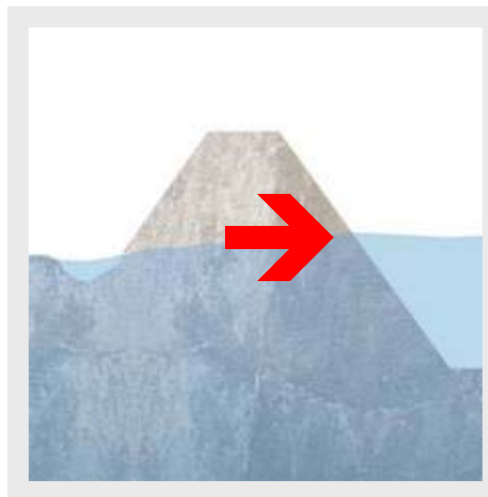
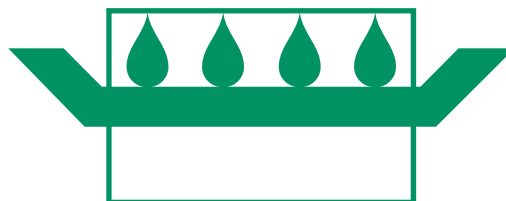
Geosynthetics - Functions

Sealing

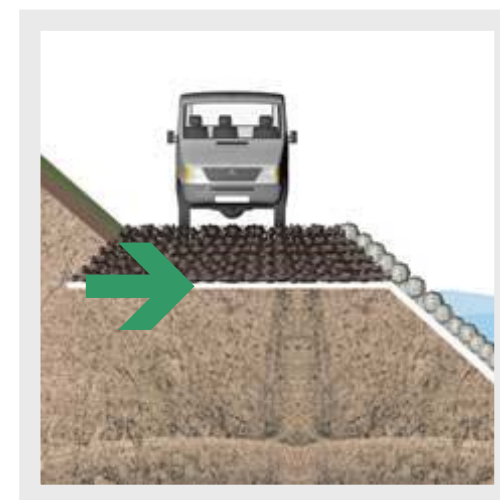
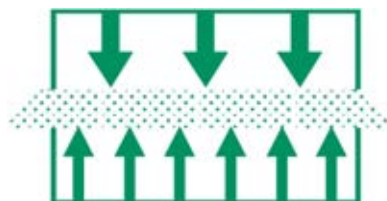


Geosynthetics - Functions

Sealing

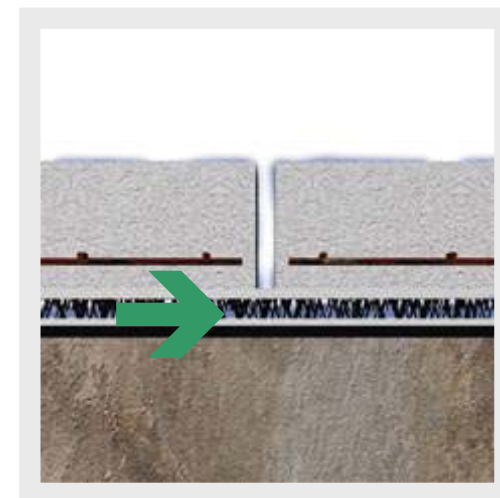
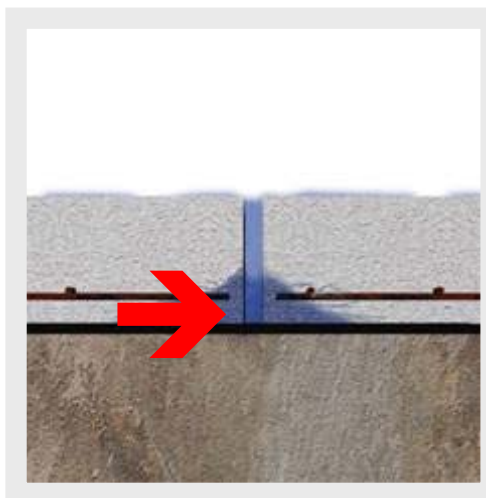
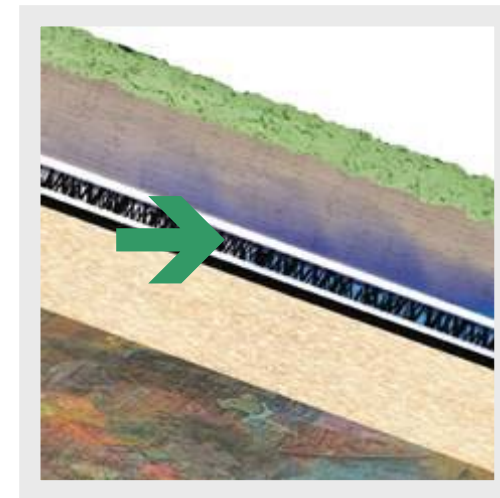
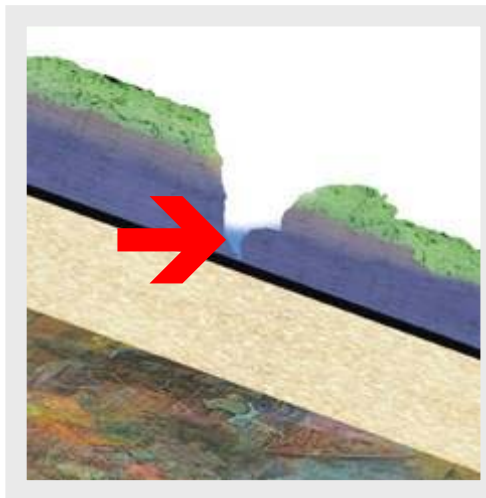


Separation



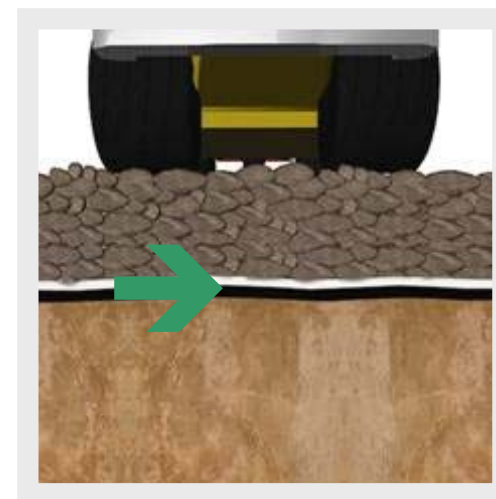
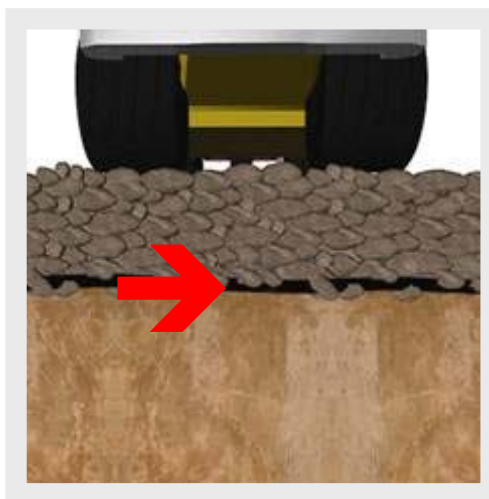
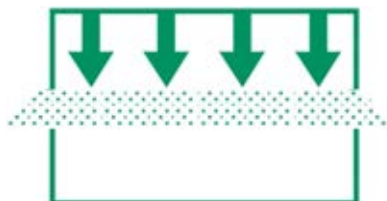
Geosynthetics - Functions

Drainage

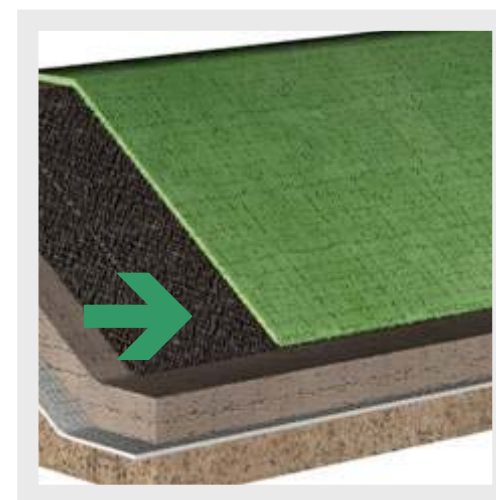


Geosynthetics - Functions

Protection

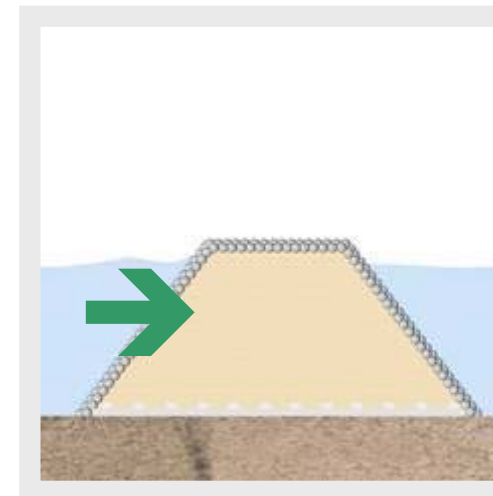
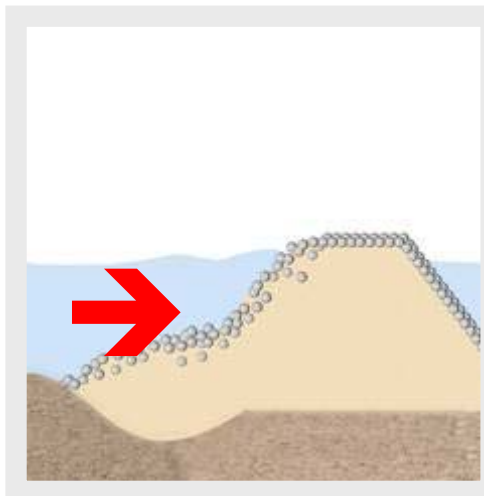
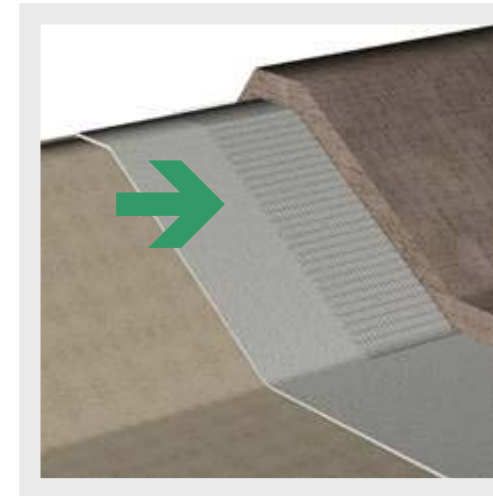


Erosion Control



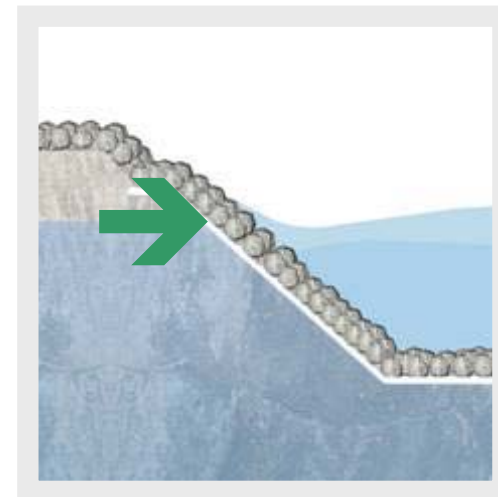
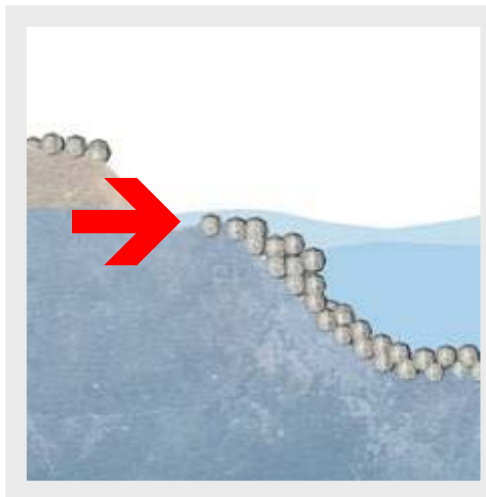
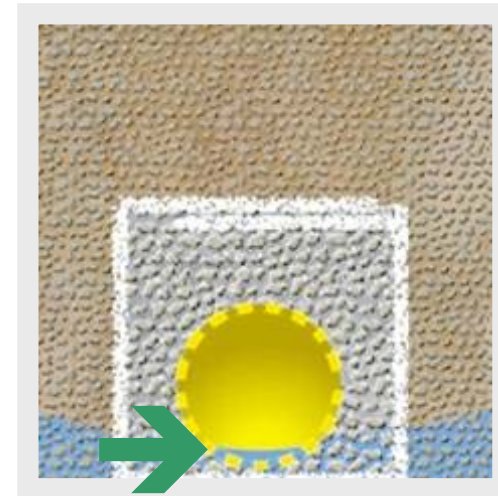
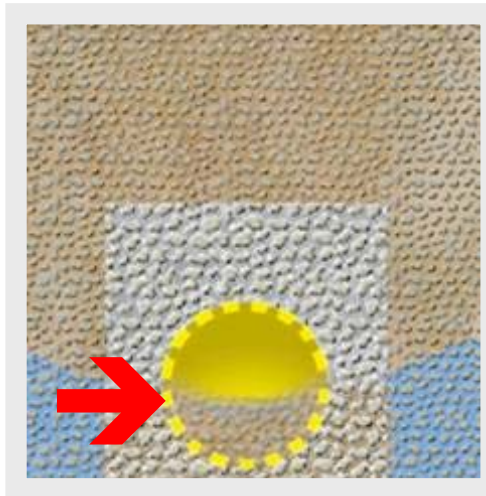
Geosynthetics - Functions

Reinforcement



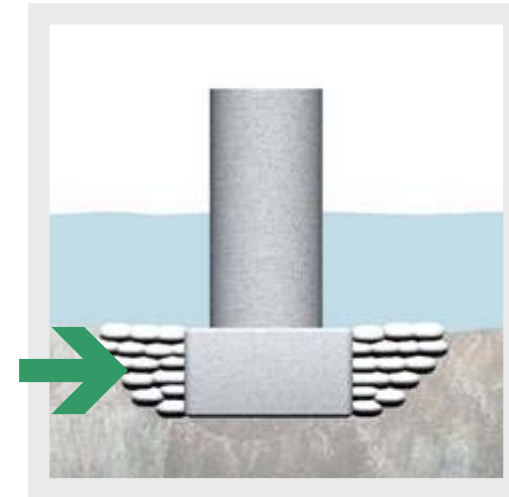
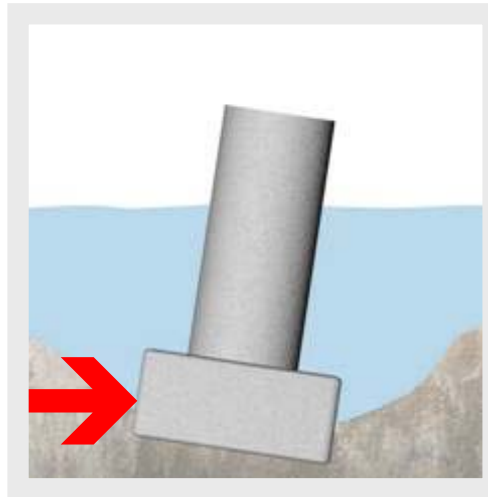
Geosynthetics - Functions

Filtration



Geosynthetics - Functions

Containment



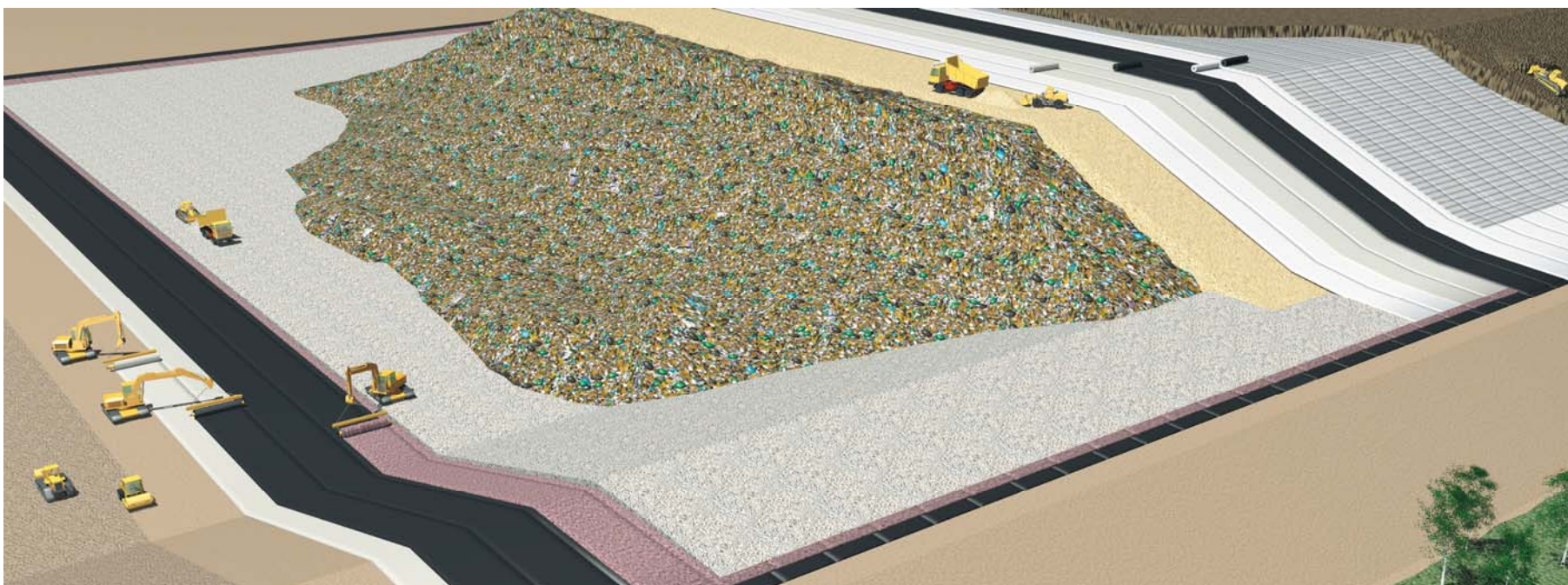
Geosynthetics from NAUE - Applications

Civil Engineering



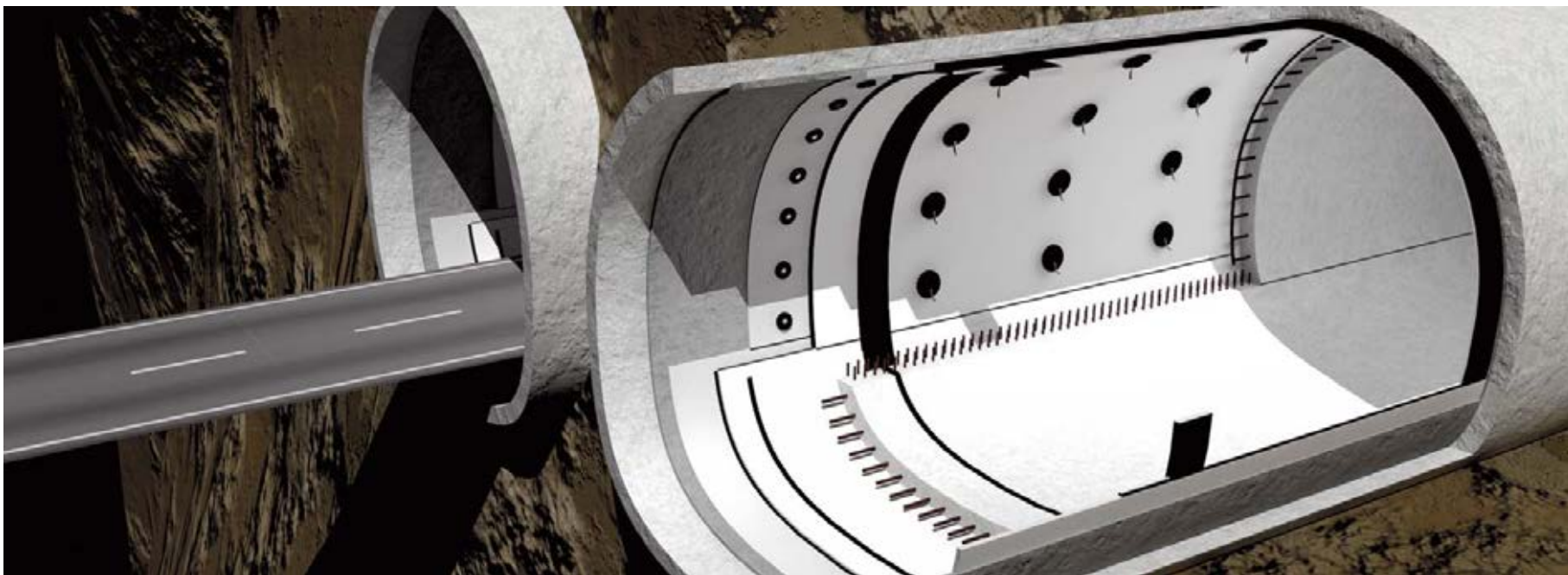
Geosynthetics from NAUE - Applications

Landfill Engineering



Geosynthetics from NAUE - Applications

Tunneling



Geosynthetics from NAUE - Applications

Environmental Protection



Geosynthetics from NAUE - Applications

Hydraulic Engineering



Geosynthetics from NAUE

Bentofix®



Geosynthetic clay liner (GCL)

Carbofol®



Geomembranes

Combigrid®



Geogrid with integrated nonwoven geotextile component

Secudrain®



Three-dimensional drainage system

Secugrid®



Geogrid for soil reinforcement

Secumat®



Three-dimensional erosion control mat

Secutex®



Needle-punched staple fibre nonwoven geotextile

Terrafix®



Special fibre nonwoven geotextile for hydraulic engineering

Geosynthetics from NAUE

Secugrid®



Geogrid for soil reinforcement

Geosynthetics from NAUE

Bentofix®

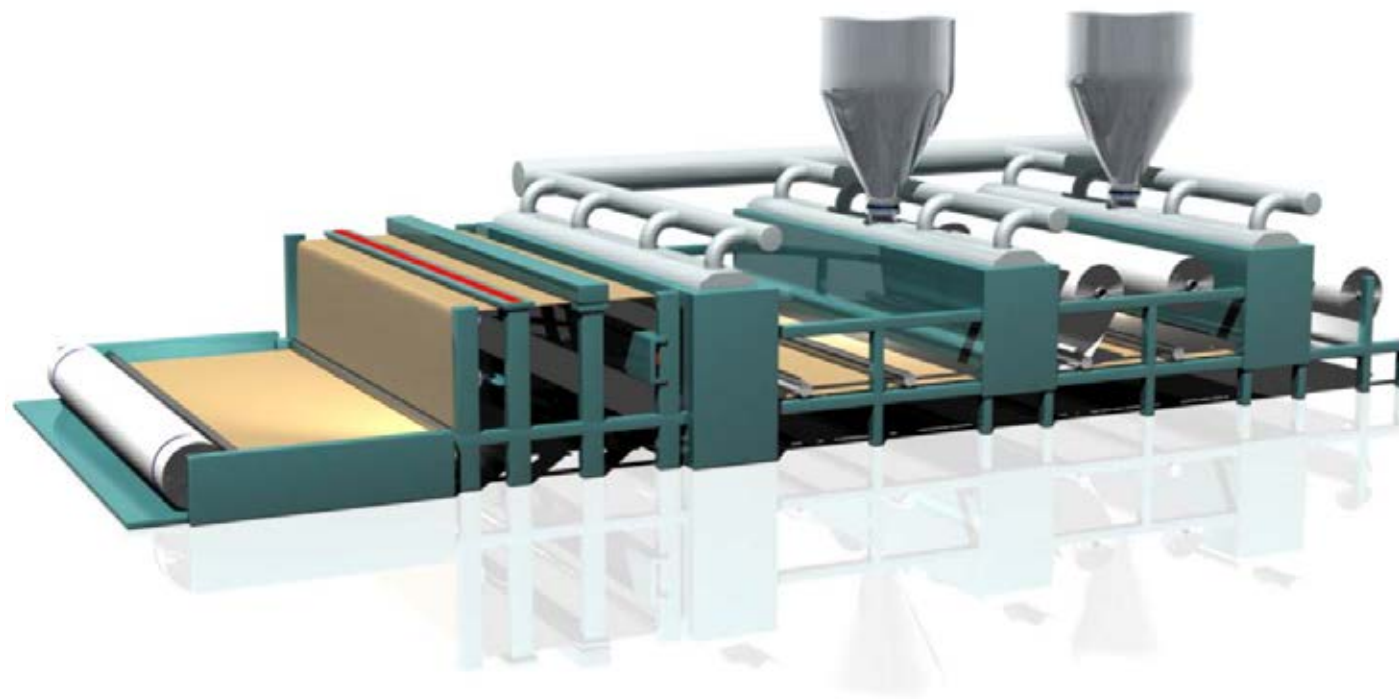
Fibre-reinforced geosynthetic clay liners (GCL)



Geosynthetics from NAUE

Bentofix®

Production line for geosynthetic clay liners (GCL)



Geosynthetics from NAUE

Bentofix®

Fibre-reinforced geosynthetic clay liners (GCL)



Project: landfill sealing systems



Geosynthetics from NAUE

Bentofix®

Fibre-reinforced geosynthetic clay liners (GCL)



Project: sealing of canals



Geosynthetics from NAUE

Bentofix®

Fibre-reinforced geosynthetic clay liners (GCL)



Project: underwater installation



Geosynthetics from NAUE

Bentofix®

Fibre-reinforced geosynthetic clay liners (GCL)



Project: pipe lining



Geosynthetics from NAUE

Bentofix®

Fibre-reinforced geosynthetic clay liners (GCL)



Project: waterproofing



Geosynthetics from NAUE

Bentofix®

Fibre-reinforced geosynthetic clay liners (GCL)



Project: stormwater retention ponds



Geosynthetics from NAUE

Bentofix®

Fibre-reinforced geosynthetic clay liners (GCL)



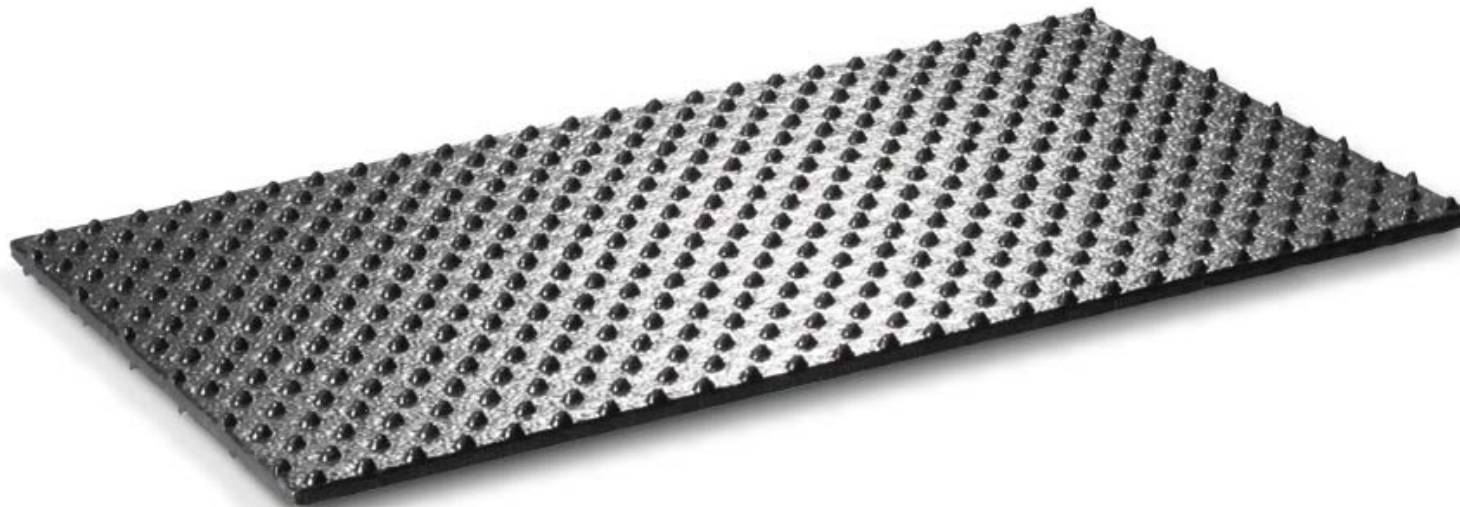
Project: sealing of dykes



Geosynthetics from NAUE

Carbofol®

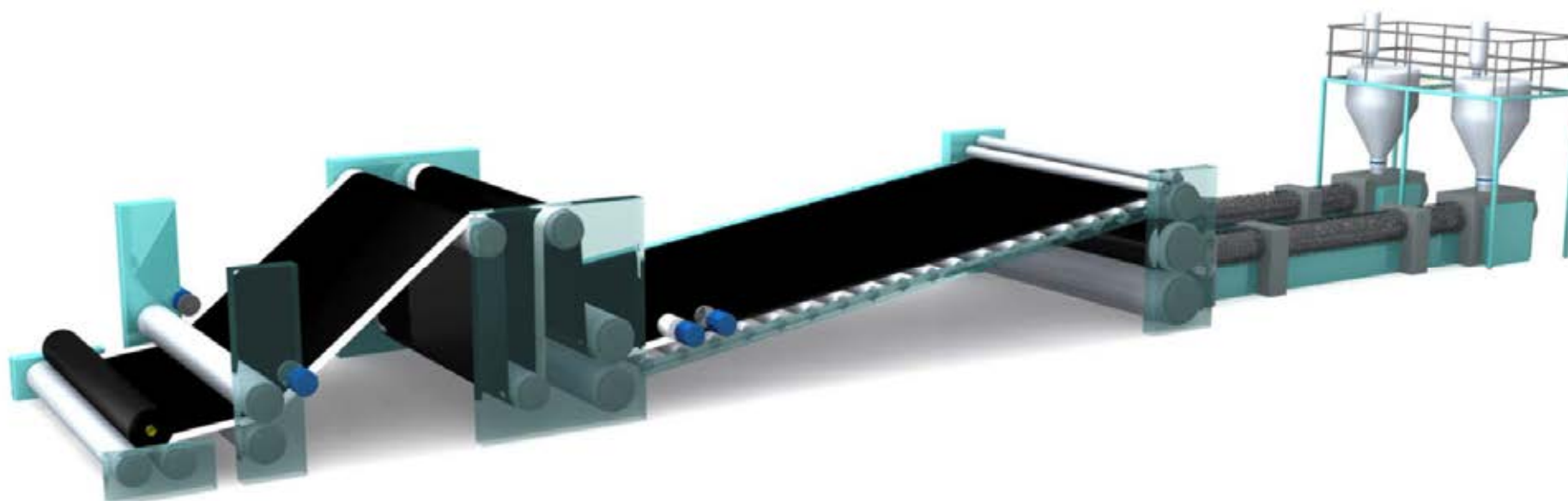
HDPE geomembranes smooth or structured



Geosynthetics from NAUE

Carbofol®

Production line for geomembranes (HDPE)



Geosynthetics from NAUE

Carbofol®

HDPE geomembranes



Project: water reservoir



Geosynthetics from NAUE

Carbofol®

HDPE geomembranes



Project: canals for power generation



Geosynthetics from NAUE

Carbofol®

HDPE geomembranes



Project: tunnel system sealing



Geosynthetics from NAUE

Carbofol®

HDPE geomembranes



Project: landfill base liners



Geosynthetics from NAUE

Carbofol®

HDPE geomembranes



Project: landfill caps



Geosynthetics from NAUE

Carbofol®

HDPE geomembranes



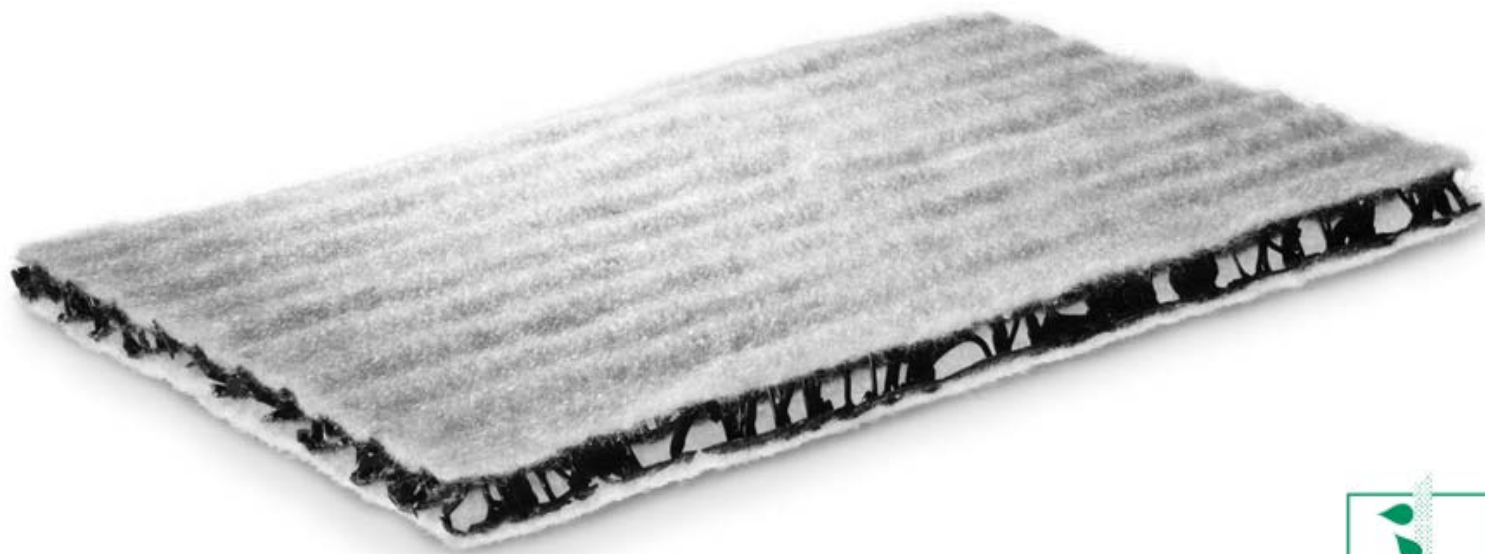
Project: environmental protection



Geosynthetics from NAUE

Secudrain®

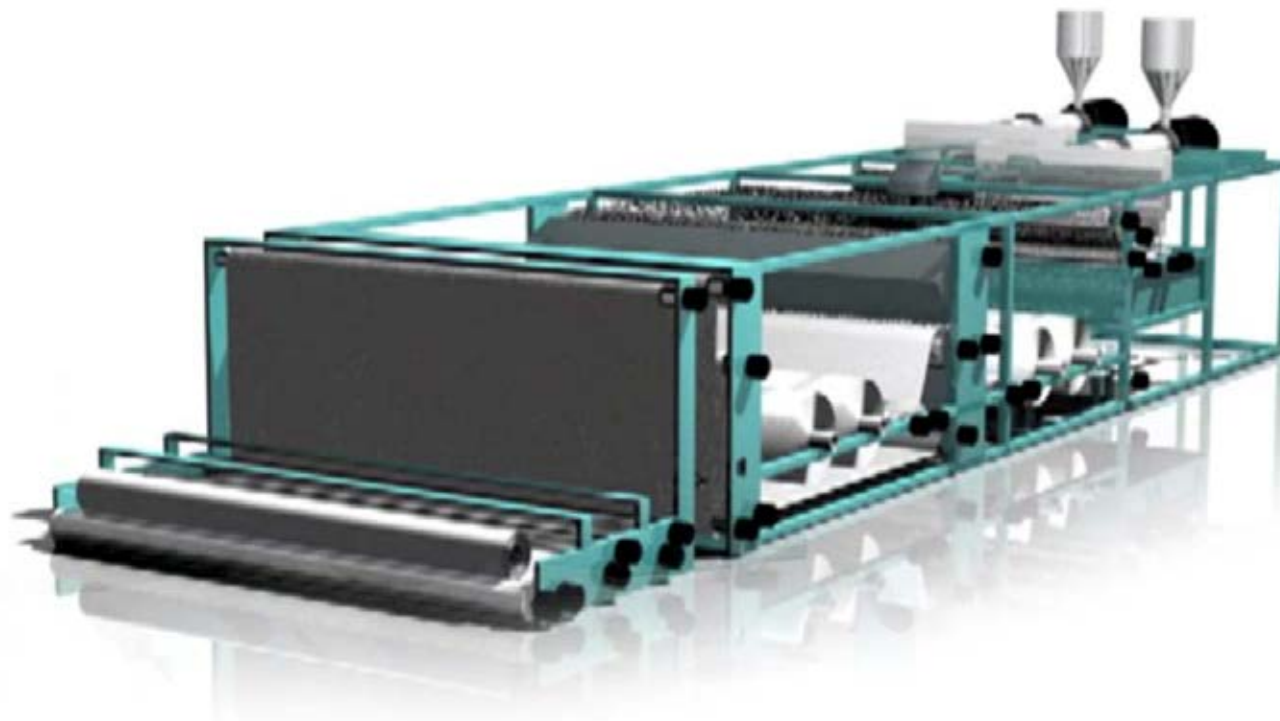
Drainage system: synthetic core with nonwoven geotextile filters



Geosynthetics from NAUE

Secudrain®

Production line for geosynthetic drainage systems with nonwoven geotextiles



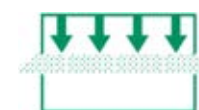
Geosynthetics from NAUE

Secudrain®

Drainage system: synthetic core with nonwoven geotextile filters



Project: landfills



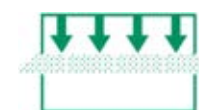
Geosynthetics from NAUE

Secudrain®

Drainage system: synthetic core with nonwoven geotextile filters



Project: landfills



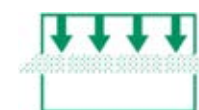
Geosynthetics from NAUE

Secudrain®

Drainage system: synthetic core with nonwoven geotextile filters



Project: underground structures



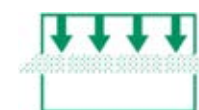
Geosynthetics from NAUE

Secudrain®

Drainage system: synthetic core with nonwoven geotextile filters



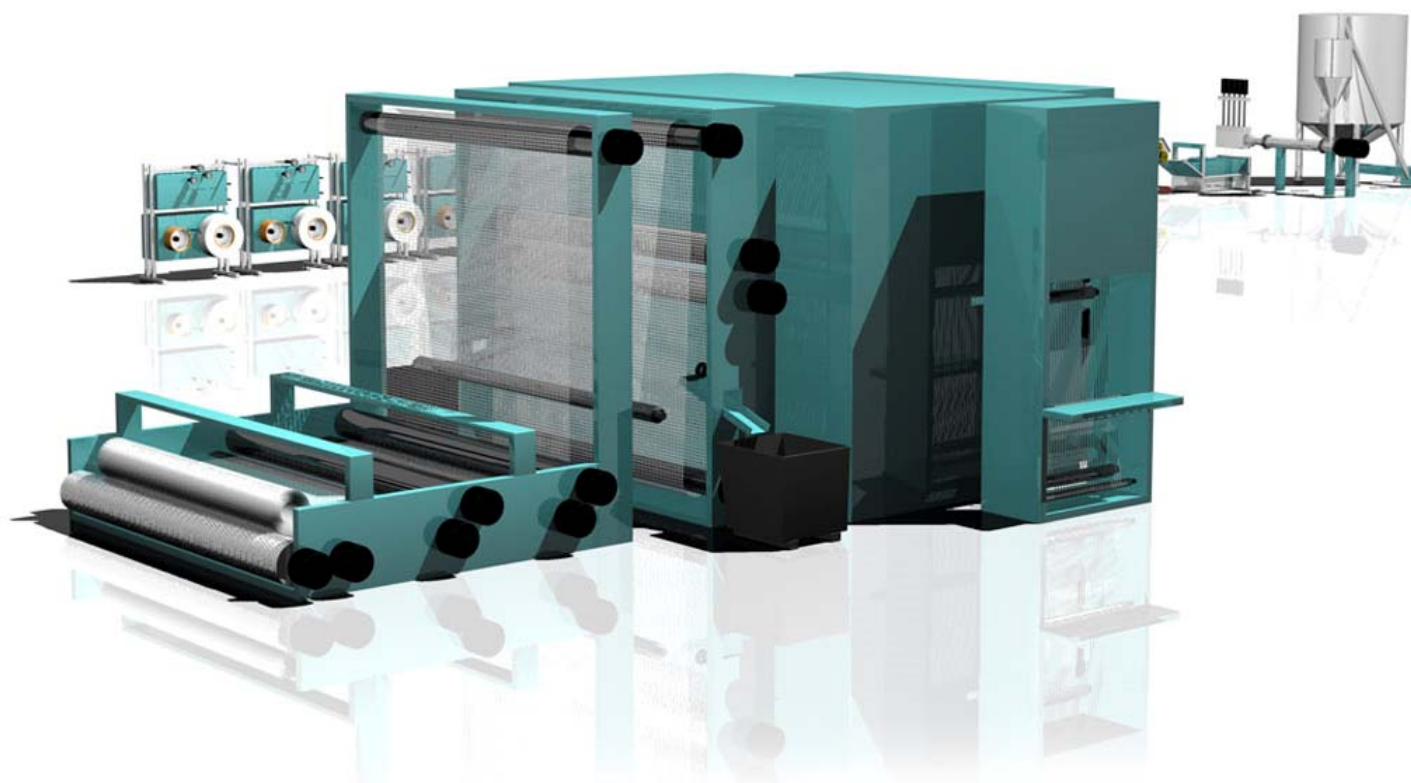
Project: tunnels



Geosynthetics from NAUE

Secugrid®

Production line for geogrids



Geosynthetics from NAUE

Secugrid®

Geogrids for soil reinforcement applications



Project: base course reinforcement



Geosynthetics from NAUE

Secugrid®

Geogrids for soil reinforcement applications



Project: road construction



Geosynthetics from NAUE

Secugrid®

Geogrids for soil reinforcement applications



Project: airport runways



Geosynthetics from NAUE

Secugrid®

Geogrids for soil reinforcement applications



Geosynthetics from NAUE

Secugrid®

Geogrids for reinforcement application



Project: mechanically stabilised earth



Geosynthetics from NAUE

Secugrid®

Geogrids for reinforcement application



Project: mechanically stabilised earth



Geosynthetics from NAUE

Secugrid®

Geogrids for reinforcement application



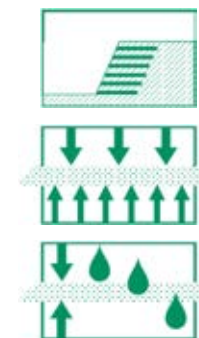
Project: mechanically stabilised earth



Geosynthetics from NAUE

Combigrid®

Multifunctional composite product for soil reinforcement, separation, drainage and filtration



Geosynthetics from NAUE

Combigrid®

Production line for geogrids with firmly integrated nonwoven geotextile



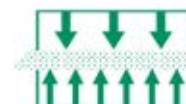
Geosynthetics from NAUE

Combigrid®

Multifunctional composite product for soil reinforcement, separation, drainage and filtration



Project: railways



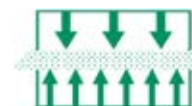
Geosynthetics from NAUE

Combigrid®

Multifunctional composite product for soil reinforcement, separation, drainage and filtration



Project: access roads for windfarm parks



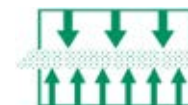
Geosynthetics from NAUE

Combigrid®

Multifunctional composite product for soil reinforcement, separation, drainage and filtration



Project: base course reinforcement



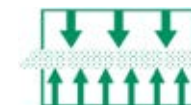
Geosynthetics from NAUE

Combigrid®

Multifunctional composite product for soil reinforcement, separation, drainage and filtration



Project: soil reinforcement over weak soils



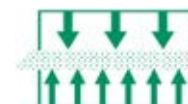
Geosynthetics from NAUE

Combigrid®

Multifunctional composite product for soil reinforcement, separation, drainage and filtration



Project: slope stabilisation



Geosynthetics from NAUE

Secumat®

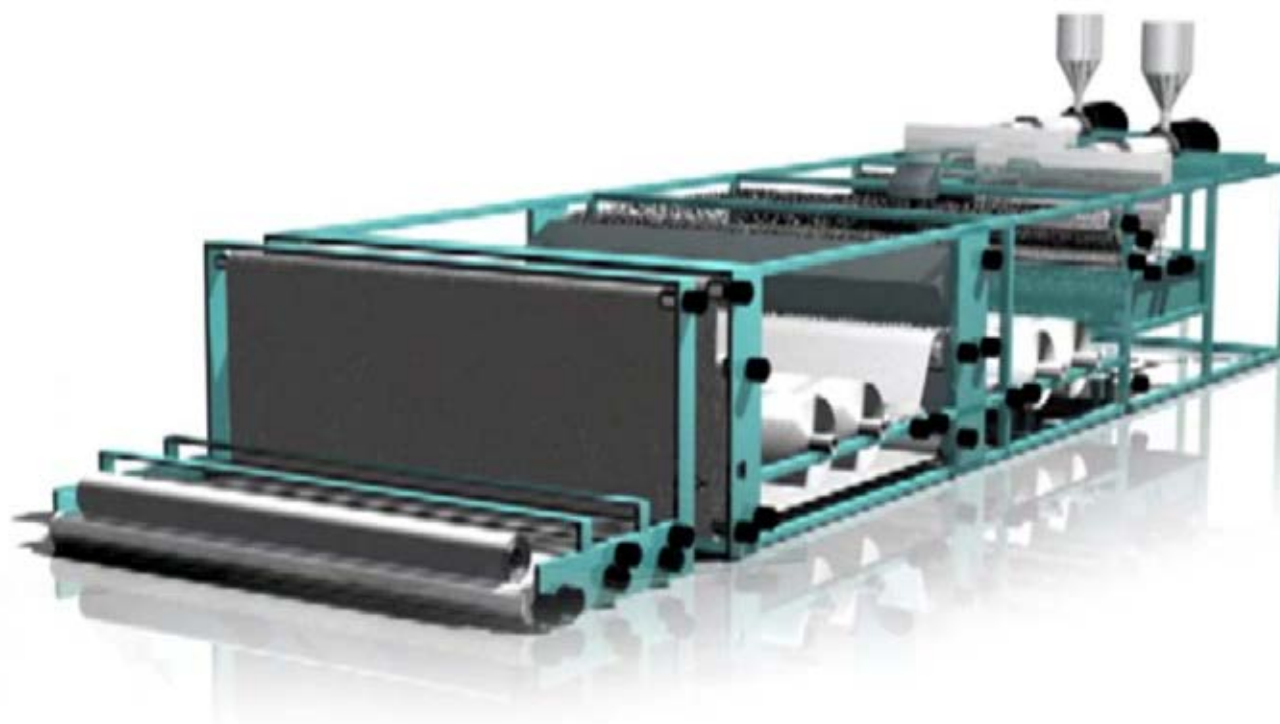
Erosion control mats



Geosynthetics from NAUE

Secumat®

Production line for erosion control mats



Geosynthetics from NAUE

Secumat®

Erosion control mats



Project: roofing



Geosynthetics from NAUE

Secumat®

Erosion control mats



Project: vegetation for steep slopes



Geosynthetics from NAUE

Secumat®

Erosion control mats



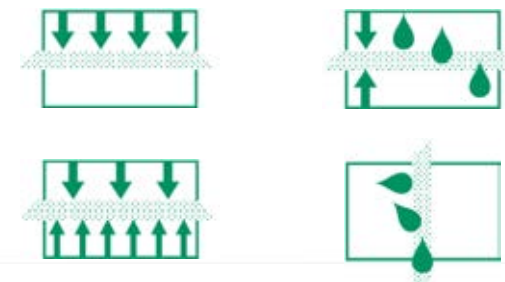
Project: hydraulic engineering



Geosynthetics from NAUE

Secutex®

Multifunctional geotextile nonwoven for separation, filtration, protection and drainage



Geosynthetics from NAUE

Secutex®

Production line for mechanically bonded (needlepunched) nonwoven geotextiles



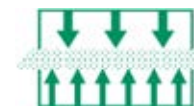
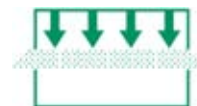
Geosynthetics from NAUE

Secutex®

Multifunctional geotextile nonwoven for separation, filtration, protection and drainage



Project: concrete roads



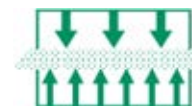
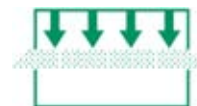
Geosynthetics from NAUE

Secutex®

Multifunctional geotextile nonwoven for separation, filtration, protection and drainage



Project: pipelines



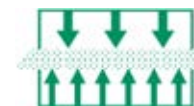
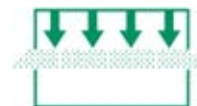
Geosynthetics from NAUE

Secutex®

Multifunctional geotextile nonwoven for separation, filtration, protection and drainage



Project: landfills



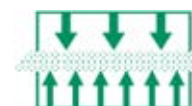
Geosynthetics from NAUE

Secutex®

Multifunctional geotextile nonwoven for separation, filtration, protection and drainage



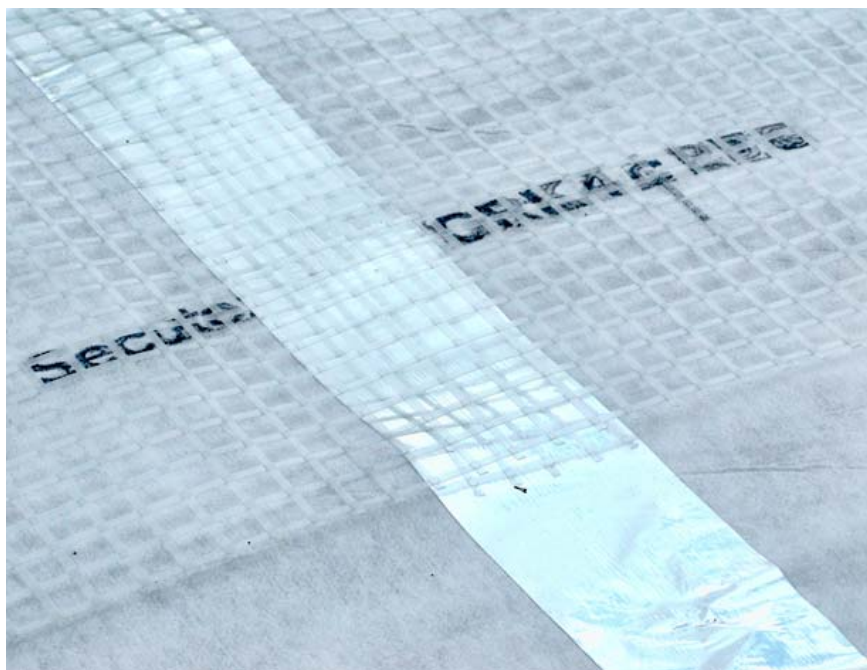
Project: tunnels



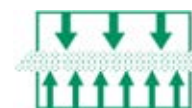
Geosynthetics from NAUE

Secutex® RDG®

Multifunctional geotextile nonwoven for separation, filtration, protection and drainage



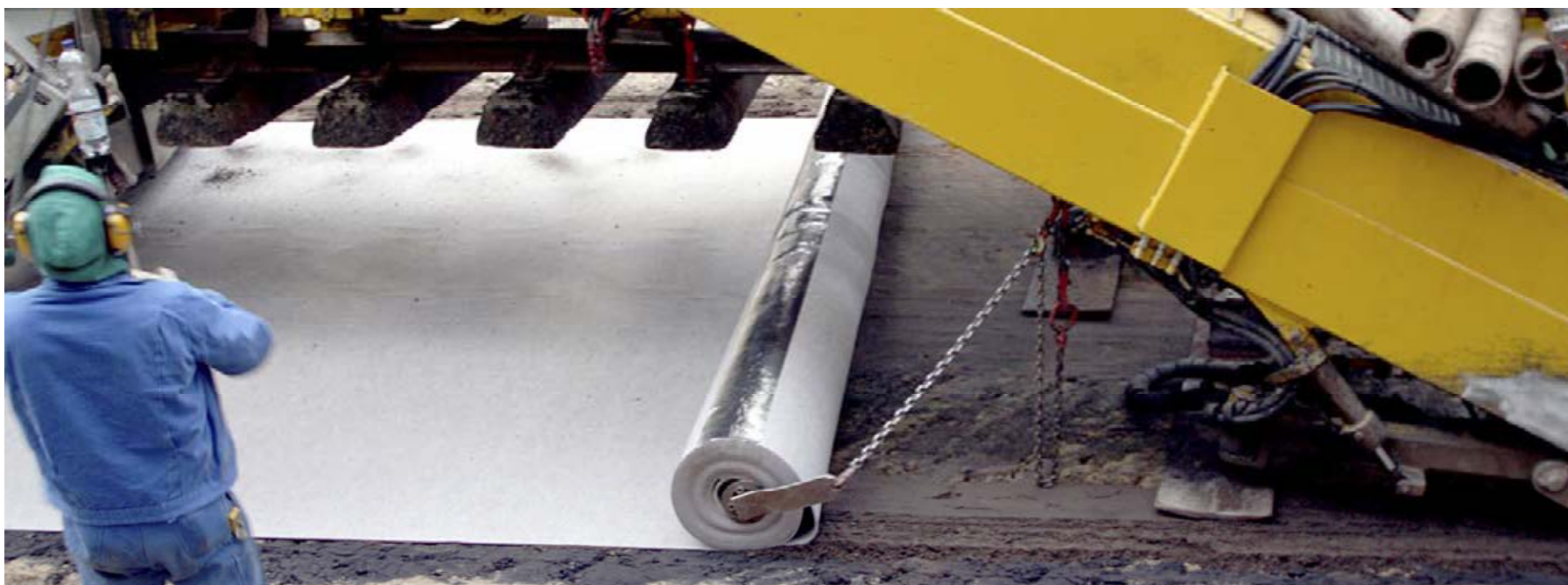
Project: Secutex® RDG
for railways



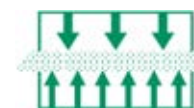
Geosynthetics from NAUE

Secutex® RDG®

Multifunctional geotextile nonwoven for separation, filtration, protection and drainage



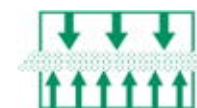
Project: railways



Geosynthetics from NAUE

Terrafix®

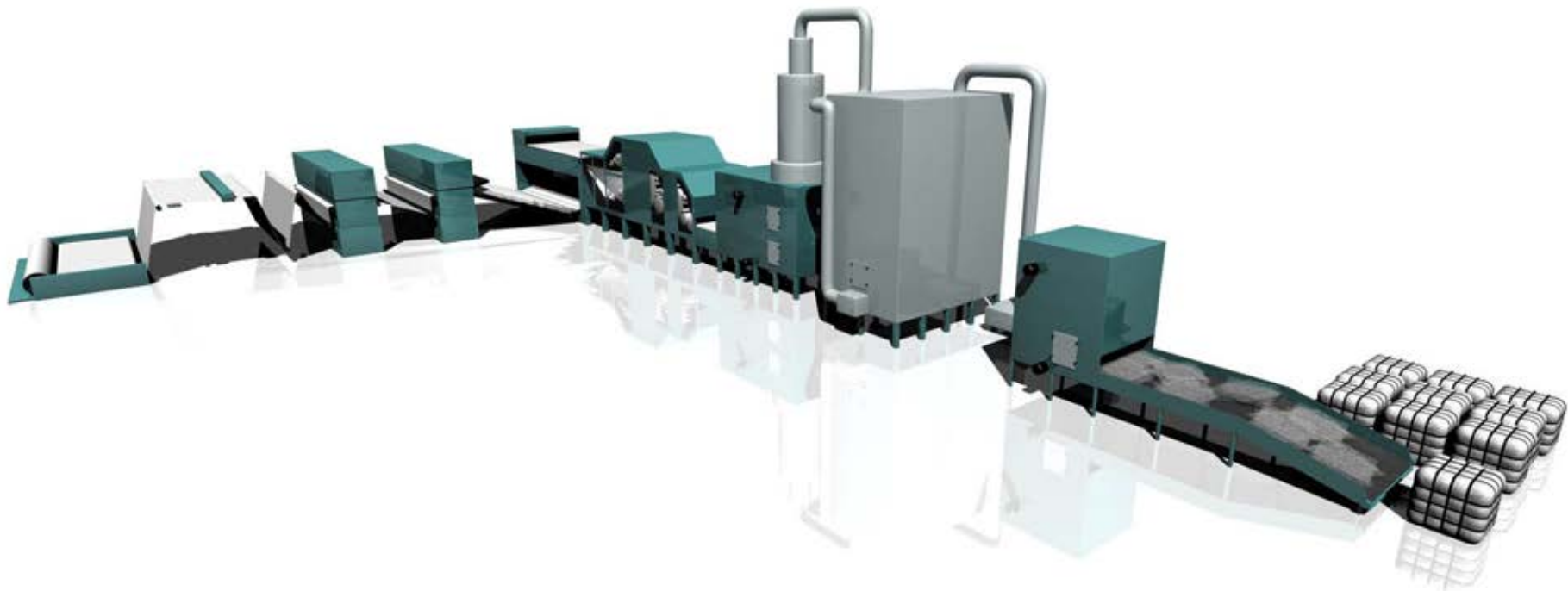
Geotextile nonwovens for filtration, erosion control, and scour protection



Geosynthetics from NAUE

Terrafix®

Production line for mechanically bonded (needlepunched) nonwoven geotextiles



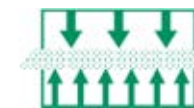
Geosynthetics from NAUE

Terrafix®

Geotextile nonwovens for filtration, erosion control, and scour protection



Project: coastal protection with sand containers



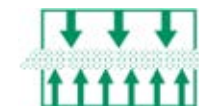
Geosynthetics from NAUE

Terrafix®

Geotextile nonwovens for filtration, erosion control, and scour protection



Project: scour protection in rivers with sand containers



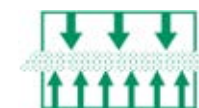
Geosynthetics from NAUE

Terrafix®

Geotextile nonwovens for filtration, erosion control, and scour protection



Project: embankment protection



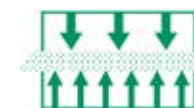
Geosynthetics from NAUE

Terrafix®

Geotextile nonwovens for filtration, erosion control, and scour protection



Project: coastal protection with a revetment mattress construction



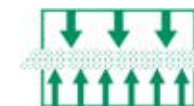
Geosynthetics from NAUE

Terrafix®

Geotextile nonwovens for filtration, erosion control, and scour protection



Project: coastal protection



Special application – hydraulic engineering

**geosynthetics
forgotten?**



Geosynthetics in scour protection

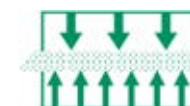
Geosynthetics from NAUE

Terrafix®

Geotextile nonwovens for filtration, erosion control, and scour protection



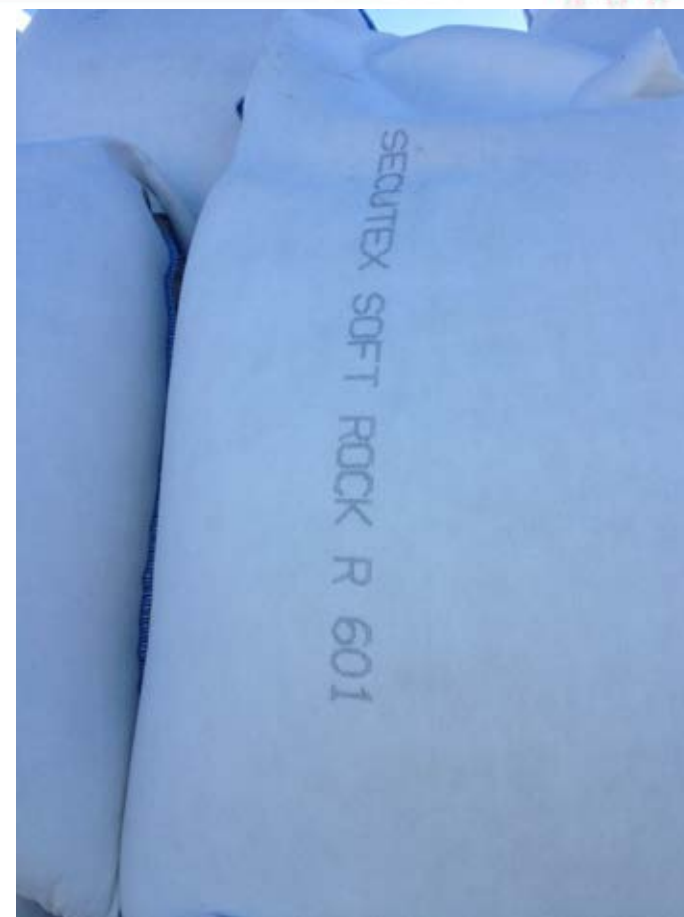
Project: Terrafix Soft Rock® containers as scour protection for offshore windfarms



First Offshore scour protection with Sandcontainers



Filling Plant Römö



SECUTEX SOFT ROCK

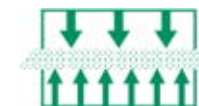
Geosynthetics from NAUE

Terrafix®

Geotextile nonwovens for filtration, erosion control, and scour protection



Project: mega Terrafix Soft Rock® containers as underwater riff



Geosynthetics from NAUE

Convenient products that **improve** the **ecological** and **economical** future of our planet

Geosynthetics reduce CO₂ emissions
and save costs.



Geosynthetics from NAUE

Reduce transport costs and improve the CO₂ balance

Example landfill sealing:

4500m² sealing with Bentofix® (geosynthetic clay liner) of NAUE

equals

1 truck

...



...
**compared
 with clay:**

4500m²
 Sealing with
 compacted clay
 500mm thick

equals

187 trucks
 (each 24 tons)



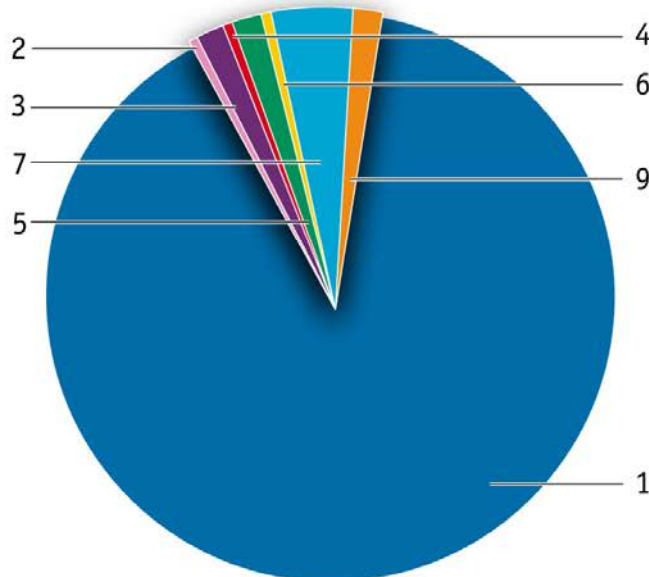
Geosynthetics from NAUE

Improvment of the CO₂ balance

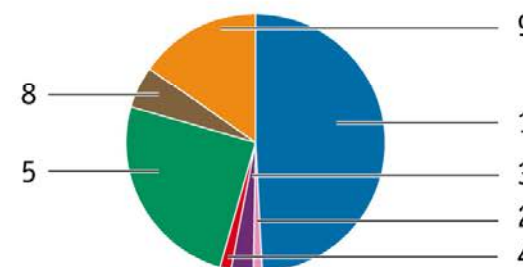
Example road construction - CO₂ emission:
Lime versus geogrid solution from NAUE:

- 1 Production
- 2 Setting
- 3 Shipment to the job-site
- 4 Removal
- 5 Soil placement and compaction
- 6 Binder distribution (Distribution machine)
- 7 Milling binder (Rotorator)
- 8 Laying geogrids
- 9 Soil compaction

Lime - 1.325 t



Geogrid (PP) - 49 t



New construction of the district road K34, between K30 and B264, district Aachen, Germany, 2008

Geosynthetics from NAUE

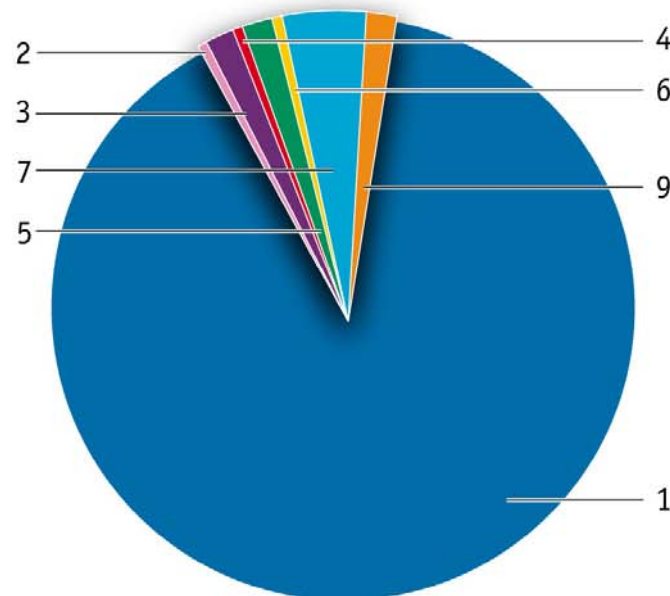
Improvment of the energy balance

Example road construction – Cumulated energy demand (CED):
Lime versus geogrid solution from NAUE:

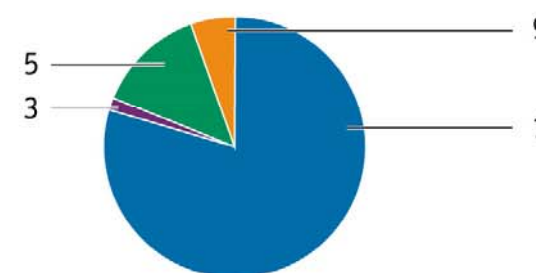


- 1 Production
- 2 Setting
- 3 Shipment to the job-site
- 4 Removal
- 5 Soil placement and compaction
- 6 Binder distribution (Distribution machine)
- 7 Milling binder (Rotorator)
- 8 Laying geogrids
- 9 Soil compaction

Lime - 6383 GJ



**Secugrid® geogrid
1182 GJ**



New construction of the district road K34, between K30 and B264, district Aachen, Germany, 2008

Geosynthetics from NAUE

Improvement of the CO₂ balance

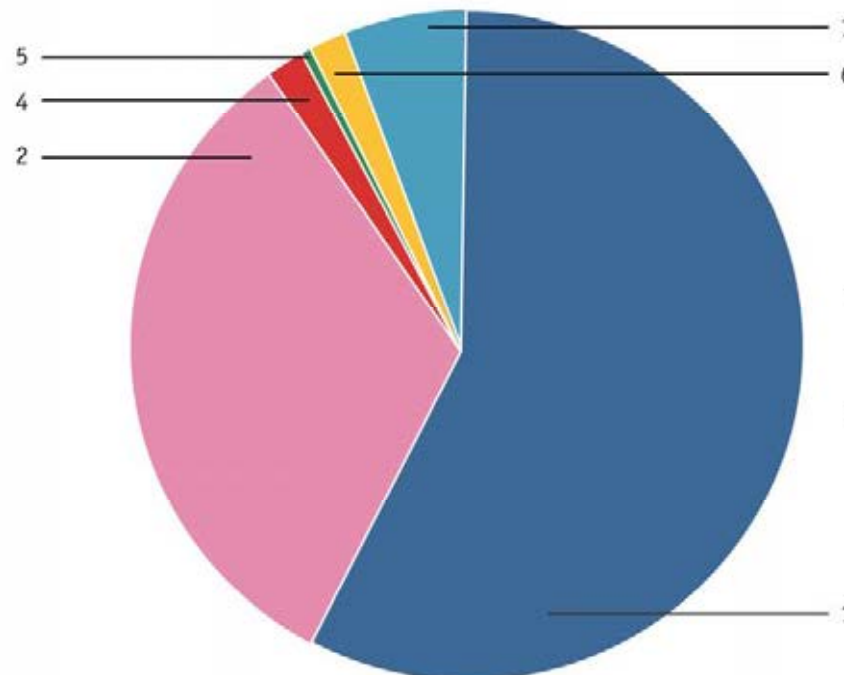


Example retaining wall - CO₂ emission:

Concrete angular retaining wall versus geogrid solution of NAUE:

- 1 Production
- 2 Production concrete steel
- 3 Production Delta Green
- 4 Transport
- 5 Production angular retaining wall
- 6 Soil exploitation and application
- 7 Soil transport to the job-site
- 8 Secugrid® installation
- 9 Production anchored concrete ridgepoles

Concrete angular retaining wall - 542 t



**Secugrid®
geogrid - 101 t**



Gänsbergspanne Idstein - Germany

Geosynthetics of NAUE

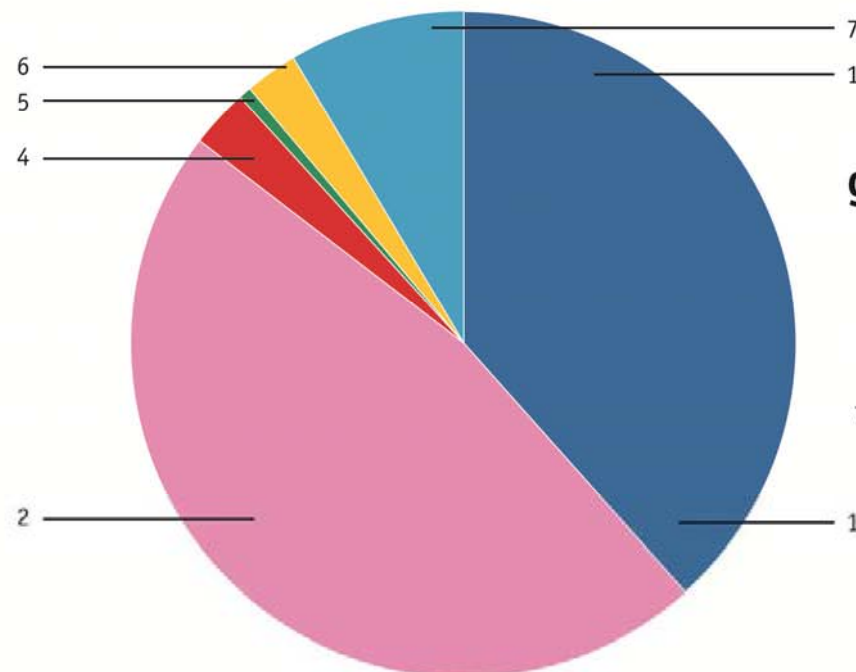
Improvment of the energy balance



Example retaining wall – Cumulated energy demand (CED):
Concrete angular retaining wall versus geogrid solution of NAUE:

- 1 Production
- 2 Production concrete steel
- 3 Production Delta Green
- 4 Transport
- 5 Production angular retaining wall
- 6 Soil exploitation and application
- 7 Soil transport to the job-site
- 8 Secugrid® installation
- 9 Production anchored concrete ridgepoles

Concrete angular retaining wall - 4549 GJ



Secugrid® geogrid - 1350 GJ



Gänsbergspanne Idstein - Germany

Geosynthetics from NAUE

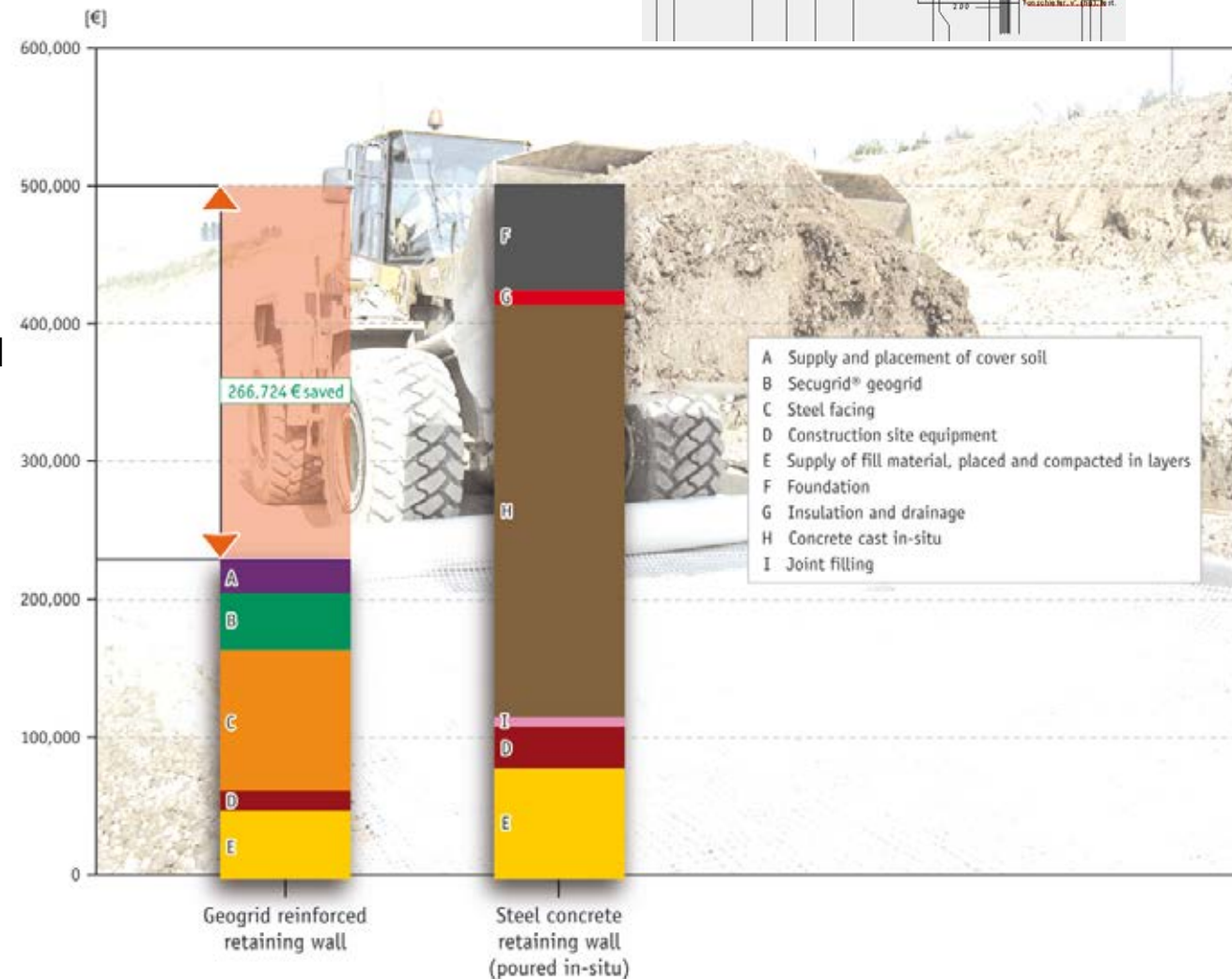
Cost reduction

Cost comparison of a
Geogrid-reinforced wall
versus a concrete
angular retaining wall

(Idstein/Germany):

266.724 € savings

with the use of
Secugrid® geogrids.



Project: Muuga Harbour, Estonia

Muuga Harbour is the biggest cargo harbour in Estonia and specialized on handling transit origin goods. It is the main cargo harbour for Port of Tallinn and locates ca 17 km east of Tallinn.

Territory:	524,2 ha
Number of berths:	29
Total length of berths:	6.4 km
Max. depth:	18 m
Max. length of a vessel:	300 m
Max. width of a vessel:	48 m



Project: Muuga Harbour, Estonia

Terminals:

- 6 liquid bulk terminals
- 2 multipurpose terminals
- container terminal
- dry bulk terminal
- grain terminal
- steel terminal
- coal terminal

Storage area:

- | | |
|--------------------------|--------------------------|
| • Warehouse area: | 151 000 m ² |
| • Open storage area: | 670 000 m ² |
| • Reefer warehouse area: | 11 500 m ² |
| • Oil tank capacity: | 1 550 150 m ³ |
| • Grain silo: | 300 000 t |



Project: Muuga Harbour, Estonia

Container Terminal project
110.000 m²

Structure (from top to bottom):

5cm AC16 surf
7cm AC20 base
30cm cement stabilized recycled asphalt material
25cm limestone aggregate (32/64 mm)

Secugrid® 30/30 Q1

Sub-base: fine sand from the sea, consolidated, measured $Ev_2=40\text{MPa}$ (CBR 5%)

Designers were supported by ViaCon Eesti - our Partners in Estonia
together with our internal consultancy BBG

Construction time:

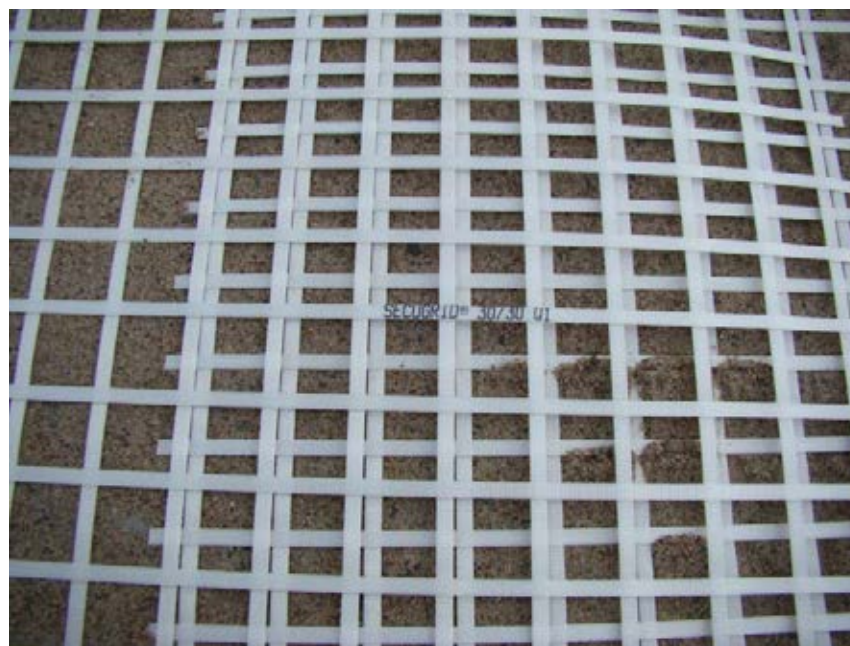
Autumn 2013



Project: Muuga Harbour, Estonia



Project: Muuga Harbour, Estonia



Installation damages? – not at all!



geogrid reinforced acces road



without geogrid



Conclusions:

- NAUE is prepared for the nordic market to support infrastructure projects together with our partners in this region
- We can offer NGS certified reinforcement products!

Thank you very much for your attention!

www.naue.com

Detailed information about geotechnics with geosynthetics

The advertisement features a large, detailed image of a human eye. The iris is replaced by a green-tinted photograph of a construction site with heavy machinery. The left side of the ad is a green diagonal band containing the company logo, website, and contact information. The right side is white with the slogan 'Die Zukunft im Blick' and 'Looking to the Future'. At the bottom right, the company's focus is stated in German and English.

NAUE
www.naue.com

Die
Zukunft
im **Blick**

Looking
to the
Future

NAUE GmbH & Co. KG
Gewerbestraße 2
32339 Espelkamp-Fiestel
Germany

Tel.: +49 5743 41-0
Fax.: +49 5743 41-240
E-Mail: info@naue.com
Internet: www.naue.com

Geotechnik mit Geokunststoffen
geotechnics with geosynthetics