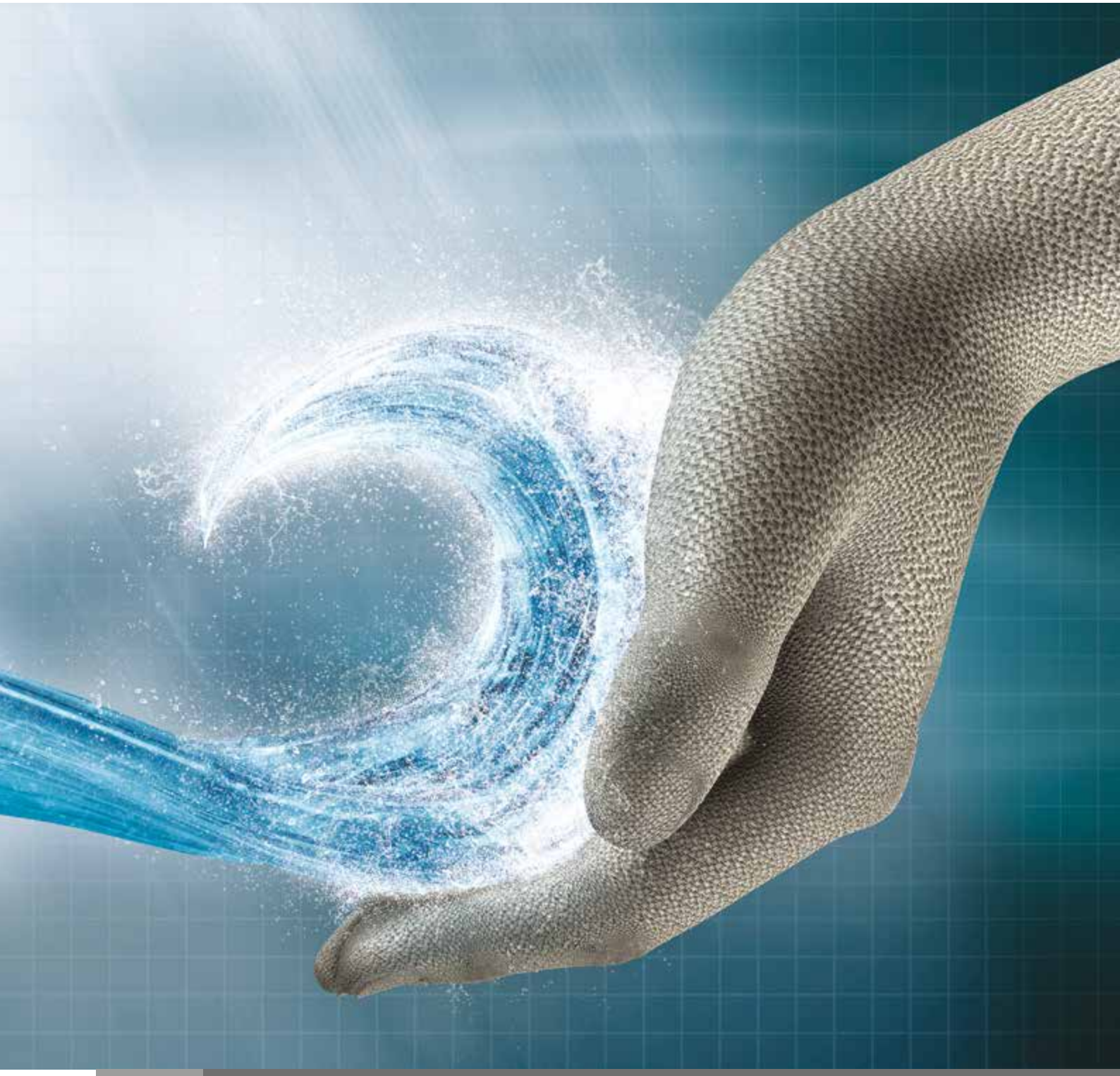


Handling Waterbodies Responsibly

Geosynthetic Solutions for Hydraulic Engineering

HUESKER
Ideen. Ingenieure. Innovationen.

We will find the Solution

Major factors such as climate change, population growth and continuing economic expansion are making sustainable hydraulic engineering solutions ever more crucial.

HUESKER's products and engineering services enable the safe and economic construction of waterways, reliably protecting infrastructure against water action movement and allowing the creation of new waterside areas. Our tailored geosynthetic product solutions ensure that the elemental forces of water are safely channelled and controlled.

Reliable performance, cost-effectiveness, sustainability and eco-compatibility: these are the four pivotal factors. That is why delivering hydraulic engineering solutions that match these criteria is the top priority for HUESKER's engineers.

Engineering Excellence

HUESKER has been setting new standards in the field of hydraulic engineering for over 50 years. Our international team includes professionals who specialise in a wide variety of applications. This wealth of expertise enables us to find solutions to virtually every problem.

We offer:
- Advice on complex questions and issues
- Support in the technical design of structures
- Site inspections aimed at design optimisation
- Sharing our knowledge and expertise

Over 50 Years of Hydraulic Engineering Experience

1963
Rüstersieler Watt
Germany
Dike construction
SoilTain® Bags

1983
Warri River
Nigeria
Revetment
Incomat® Flex

1986
Wilmington Harbour
USA
Land reclamation
Stabilenka®

1989
Mittellandkanal
Germany
Revetment
HaTe® Nonwovens

2002
Le Lavandou
France
Breakwaters
SoilTain® Tubes

2008
JadeWeserPort
Germany
Revetment
HaTe® Nonwovens
Tektoseal®
Sand mat

2013
Mittlere-Isar-Kanal
Germany
Canal refurbishment
Incomat® Standard

2016
Sedlitzer See
Germany
Cliff stabilisation
SoilTain® Tubes

Product Excellence in Hydraulic Engineering

Solutions to your Challenges

Filtration, separation, protection, containment, reinforcement and lining:
These, together with erosion control, are among the key functions of geosynthetics in hydraulic engineering. Boasting a 150-year-plus track record in textile production, HUESKER now ranks among the world's market leaders in the geotextile sector. We capitalise on this know-how every day in the manufacture of our products.

HUESKER offers a broad range of premium-quality geosynthetic products for hydraulic engineering. These include geotextile concrete mattresses, containment systems such as tubes, containers or sandbags, sinking mattresses, filter nonwovens, sand mats, clay liners and dam base reinforcement.

We offer a globally unique portfolio:
- Wide range of products
- Custom-manufacture of project-specific products
- Large selection of raw materials
- Numerous certifications

Incomat
Concrete Mattress System
Erosion control, lining

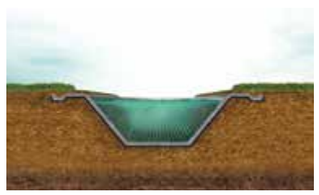
SoilTain Tubes
Erosion control, containment

Wide variety of applications

Groynes and breakwaters

Revetments

Dams and dikes



Canals

Bed protection

Land reclamation

Tektoseal Clay
Lining, erosion control

Tektoseal Sand
Filtration, separation, protection, erosion control

HaTe Nonwovens
Filtration, separation, protection

Fortrac 3D
Erosion control, reinforcement

Stabilenka
Reinforcement, separation, filtration

SoilTain Dewatering Tubes
Containment, filtration

Other products:
SoilTain Bags I Basetrac I Fortrac I NaBento I Canal³ I Sinking Mattresses

Hydraulic Engineering Solutions

Your Requirements

Reliable Performance

Dependable hydraulic engineering solutions, however complex the structure, through engineering excellence at the cutting edge of science and technology.

Cost-Effectiveness

Efficiency through rational deployment of precious financial and natural resources.

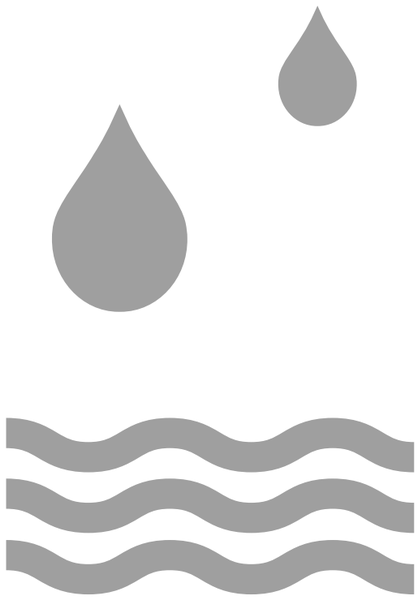
Sustainability

Future compatibility of all works through eco-friendly and context-specific system solutions.

Eco-Compatibility

Proper integration of geotextiles in ecosystem, e.g. through rapid colonisation by marine flora and fauna.

HUESKER meets
the highest demands



Our Specialties

Dams and Dikes

Reliable Flood Control and Water Containment

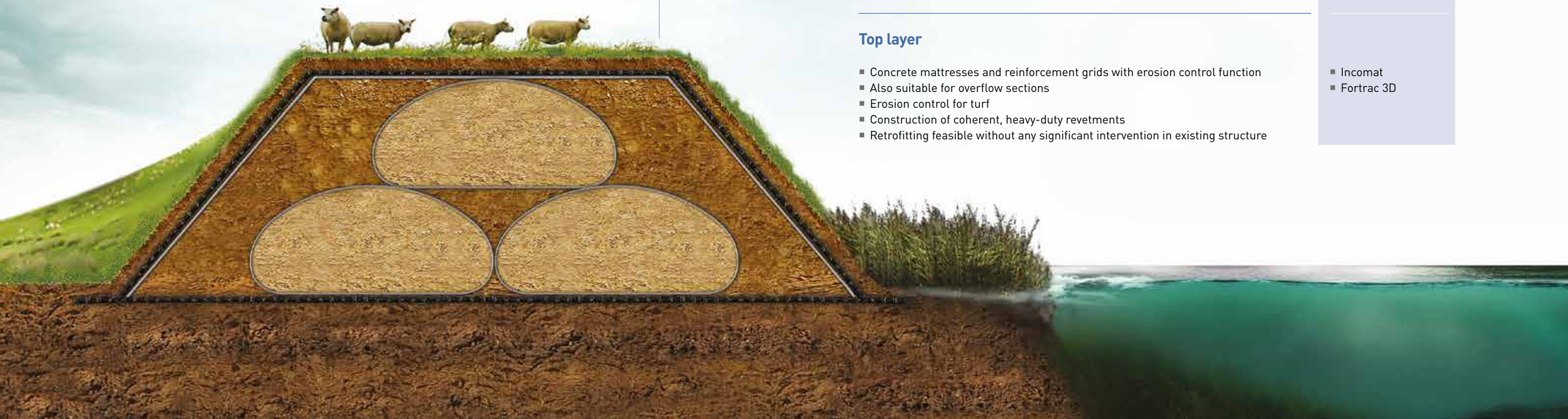
Enhanced reliability

Tested and certified geosynthetic products can be used to extend the service life of structures or substantially reduce the risk of failure. The filtration-stable containment of dike cores with geosynthetic products, among other things, almost completely rules out any risk of dike failure due to internal erosion processes. Provision for a suitable geotextile filter eliminates the need for any elaborate and error-prone installation of mineral filter layers, especially under water.

Safe and cost-effective lining

Unlike natural lining materials, geosynthetic clay liners (GCLs) – by virtue of their industrial fabrication – allow the rapid installation of a durable water-proof barrier. It is also possible to retrofit these linings to dams and dikes with minimum intervention in the existing structure. Moreover, given the smaller construction height of GCLs (approx. 1 cm in unswollen condition), transportation is less expensive than for the usual 50 cm thick conventional clay liners.

Our solution with Incomat



Base reinforcement

- Structural stability on soft soils
- Evening out of settlement
- Simultaneous filtration and separation function

Structural core

- Protection against erosion through use of geotextile containment systems
- Elimination of potential failure mechanisms in structure
- Economical use of locally sourced materials

Lining

- Fast, efficient installation of clay liners
- Thinner layers than for equivalent mineral liners
- Retrofitting feasible without any significant intervention in existing structure

Filter and separation layer

- Straightforward installation of filter
- Constant filter layer thickness
- Thinner revetment construction

Top layer

- Concrete mattresses and reinforcement grids with erosion control function
- Also suitable for overflow sections
- Erosion control for turf
- Construction of coherent, heavy-duty revetments
- Retrofitting feasible without any significant intervention in existing structure

Products

- Stabilenka
- Fortrac

- SoilTain Bags
- SoilTain Tubes
- SoilTain Dewatering Tubes

- Tektoseal Clay
- NaBento

- HaTe Nonwovens
- Tektoseal Sand
- Basetrac Woven

- Incomat
- Fortrac 3D

Groynes and Breakwaters

Sustainable Coastal and Bank Protection

Economical alternative to traditional constructions

Conventional stone fill structures generally comprise a core, several filter layers and a top layer. Industrially manufactured geosynthetics and tailored system solutions incorporating custom-fabricated units allow the optimisation of structural geometries and cross-sections. Furthermore, the use of locally sourced materials such as sand vastly reduces the need for cost-intensive material shipments, e.g. of armour stone.

Long-term stability

The straightforward installation process and the use of geosynthetics of certified quality help to minimise risks and avoid the irregularities typical of mineral filter layers. Moreover, filter-stable installation of the core containment system prevents any erosion of the core material.

Our solution with Incomat

Base area

- Reinforcement/filter layer at base
- Straightforward underwater installation compared to standard solutions
- Evening out of settlement
- Simultaneous filtration and separation function

Structural core

- Use of geotextile containment systems
- Rapid installation of barrier, even under water
- Economical use of locally sourced materials (e.g. sand)

Filter and protective layer

- Constant filter layer thickness
- High robustness
- Reduced revetment construction thickness

Top layer

- Permeable or impermeable geotextile concrete mattress layer
- Filter-stable construction with smaller thickness
- Rapid installation, even under water
- Retrofitting feasible without any significant intervention in existing structure

Products

- Stabilenka
- Fortrac
- HaTe Nonwovens
- Sinking Mattresses
- Tektoseal Sand

- SoilTain Bags
- SoilTain Tubes
- SoilTain Dewatering Tubes

- HaTe Nonwovens
- Tektoseal Sand
- Basetrac Woven

- Incomat
- SoilTain Bags
- HaTe Nonwovens

Revetments

Efficient Material Use and Maximum Reliability

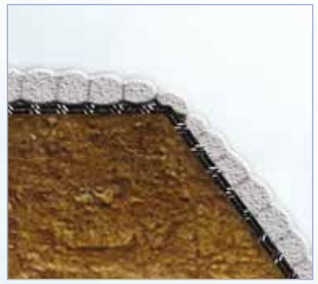
Fast and flexible installation

Over the years, geotextile filters have established themselves as a standard revetment solution. Specification of a suitable geosynthetic system paves the way for the quick and efficient construction of long-lasting revetments. Geosynthetic products also lend themselves to use in remedial protective measures, e.g. scour fill at the toe of slopes or the stabilisation of eroding cliffs.

Reliable and economical

Geosynthetic container units are filled with locally sourced materials. Mineral filters or stone revetments can be replaced by geosynthetic products. This reduces the logistical effort and boosts cost-effectiveness.

Our solution with SoilTain



Our solution with Incomat

Filter and protective layer

- Geotextile filter
- Constant filter layer thickness
- High robustness
- Reduced revetment construction thickness

Sandbag top layer

- Use of small-sized geotextile containment systems
- Flexible and adaptable revetment
- For long-term or temporary applications
- Optional use of locally sourced materials, e.g. sand
- Different geosynthetic types depending on application

Concrete mattress top layer

- Use of permeable or impermeable concrete mattresses
- Filter-stable construction with smaller thickness
- Rapid installation, even under water
- Retrofitting feasible without any significant intervention in existing structure

Products

- HaTe Nonwovens
- Tektoseal Sand
- Basetrac Woven

- SoilTain Bags

- Incomat

Canals

Supreme Lining and Erosion Control Performance

Lining under operating conditions

Particularly on power station canal refurbishment projects where installation of the lining necessitates drainage of the canal, the resulting downtime and lost energy production pose a major problem. Here, Incomat Standard, a lining system requiring neither full nor partial canal drainage, offers the ideal solution. The concrete lining also provides long-lasting erosion protection.

Lining in dry state

HUESKER's product portfolio additionally features geosynthetic systems for lining power station, irrigation and drinking water canals under dry conditions. Some of these applications involve the use of geosynthetic clay liners.

Filter and separation layer

- Geotextile filters
- Constant filter and protective layer thickness
- High robustness
- Reduced revetment construction thickness

Lining

- Use of geosynthetic concrete mattress systems
- Constant concrete thickness on steep slopes and under water
- Installable under operating conditions
- Additional erosion control function

Erosion control

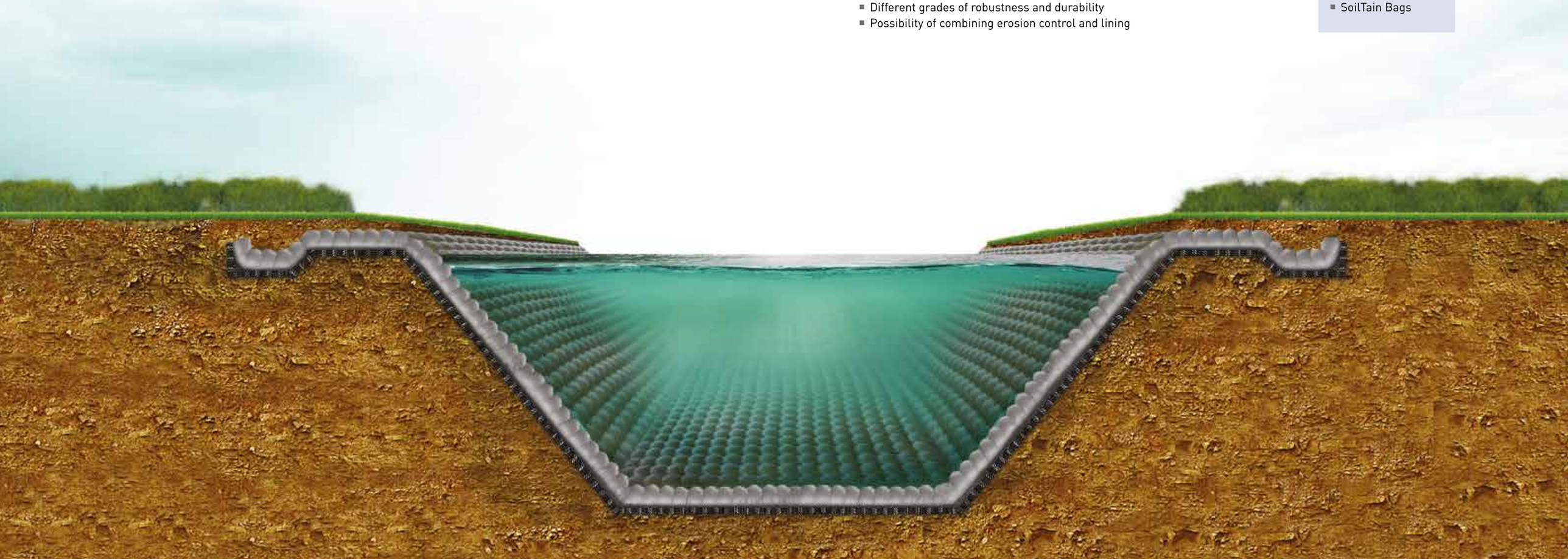
- Range of system designs of varying appearance
- Different grades of robustness and durability
- Possibility of combining erosion control and lining

Products

- HaTe Nonwovens
- Tektoseal Sand
- Basetrac Woven

- Incomat
- Tektoseal Clay
- NaBento
- Canal[3]

- Incomat
- SoilTain Bags



Bed Protection

Economical Alternatives to Conventional Stone Fill

Heavy-duty revetments for underwater installation

Unlike conventional stone revetments, concrete mattresses allow the installation of slender, efficient, heavy-duty revetments, e.g. for boat landings, even at greater water depths. They can replace stone layers of several metres thickness: providing a robust alternative scour protection solution.

High-precision filter installation even at greater water depths

Prefabricated sinking mattresses or sand mats can also be used for conventional stone revetments to optimise construction thickness or ensure controlled installation. Geotextile containers allow the placement of filter-stable layers both under exposure to strong currents and for scour fill with steep slopes.

Filter and separation layer

- Use of prefabricated sinking mattresses or sand mats
- Installation at greater water depths
- Replacement of mineral filters
- Reduced revetment construction thickness

Sandbag top layer

- Use of small-sized geotextile containers
- Optimised construction height
- Additional units installable for remedial stabilisation
- Revetments adaptable to edge scour

Concrete mattress top layer

- Heavy-duty concrete mattress systems (permeable or impermeable)
- Force transmission via revetment surface
- Coherent, jointless construction
- Minimised construction height

Products

- Tektoseal Sand
- HaTe Nonwovens
- Sinking Mattresses
- SoilTain Bags

- SoilTain Bags

- Incomat

Land Reclamation

Innovative System Solutions for Perimeter Dikes

Efficient construction

Geosynthetic products facilitate construction in water and waterside areas. The erosion-resistant containment of fill materials simplifies and speeds up the erection of dams and dikes under the action of wave and current loads.

Long-term stabilisation

Apart from the short-term benefits of „sustainable containment", the filter-stable construction also enhances the long-term stability of the structure.

Base area

- Geosynthetic reinforcement/filter layer
- Simultaneous filtration and separation function
- Straightforward underwater installation compared to standard solutions
- Particularly advantageous in tidal areas
- Evening out of settlement

Perimeter dike

- Geotextile containment systems for erosion-resistant barrier
- Elimination of potential failure mechanisms
- Simplified underwater installation
- Economical use of locally sourced materials

Filter and protective layer

- Constant filter layer thickness
- High robustness
- Reduced revetment construction thickness

Base reinforcement

- Straightforward installation
- Filtration and separation function
- Increased bearing capacity
- Lower base course thickness

Products

- Stabilenka
- Fortrac
- HaTe Nonwovens
- Sinking Mattresses
- Tektoseal Sand

- SoilTain Bags
- SoilTain Tubes
- SoilTain Dewatering Tubes

- HaTe Nonwovens
- Tektoseal Sand
- Basetrac Woven

- Basetrac
- Stabilenka

Application Examples

Overflow section

Austria, 2016, stabilisation of overflow section of flood retention basin near Furth using Incomat Crib.

Flood control dike

Germany, 2015, lining of flood control dike at Breese near River Elbe in German Federal State of Brandenburg using Tektoseal Clay
(Geosynthetic Clay Liner).

Coastal protection

Thailand, 2006, coastal protection at Tha Chin river delta estuary using SoilTain Tubes.

Land reclamation

Latvia, 2010, extension of Salacgrīva port terminal using SoilTain Tubes.

Power station canal refurbishment

Germany, 2013, refurbishment of Mittlere-Isar-Kanal without canal drainage using Incomat Standard.

Revetment construction

Germany, 2004, revetment constructed with BAW-certified HaTe Hydraulic Engineering Nonwoven along Dortmund-Ems-Kanal.

Slope and bed protection

Guatemala, 2016, slope and bed protection at new Quetzal port terminal using Incomat Standard.

Cliff stabilisation

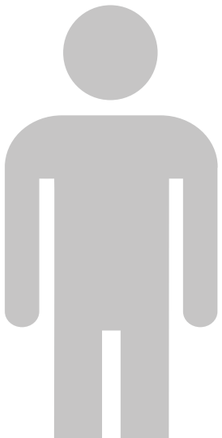
Germany, 2016, cliff stabilisation at abandoned Nordrandschlauch open-cast mine in Spreetal area using SoilTain Bags.

HUESKER Services

HUESKER Services begin with providing the customer with initial advice and end with supporting the realisation of the project on site. What we provide are safe, customised, ecologically sound and economically viable project solutions.

Services provided by our engineers

- **Hydraulic engineering design**
  Our engineers assist design practices by performing verifiable design calculations in accordance with international codes of practice.
- **Technical consulting**
  We will recommend the appropriate product types for your specific requirements.
- **Project-specific placement plans**
  We will prepare installation and placing recommendations plus installation advice.
- **International knowledge transfer**
  Best practice solutions and techniques from our global network.



At HUESKER, every
7th employee is
an engineer

Product Services

- **Custom-designed product solutions**
  We will assist you in developing custom-fabricated products to meet your particular requirements.
- **Alternative solutions**
  We will propose alternative design solutions as well as recommendations for adjustments and optimisations.

Documents

- **Certificates**
  Our products have numerous certifications that are issued, for example, by BAM, BAW, BBA, EBA, IVG and SVG, depending on the product type.
- **Installation guidelines**
  Technical guidelines will help you to ensure the best-practice installation of your product on site.
- **Tender documents**
  We would be happy to provide you with proposals for your specification texts.

On-The-Spot

- **On-site instruction**
  Where required, our application technicians can offer installation assistance related to the specifics of product installation.
- **Installation aids**
  We can offer you practical installation aids to facilitate the application of our products.
- **Training**

HUESKER Synthetic is certified to ISO 9001, ISO 14001 and ISO 50001.

CE DAkkS Deutsche Akkreditierungsstelle D-PL-19299-01-00 ivg.

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