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Funke-Schwammstadt®

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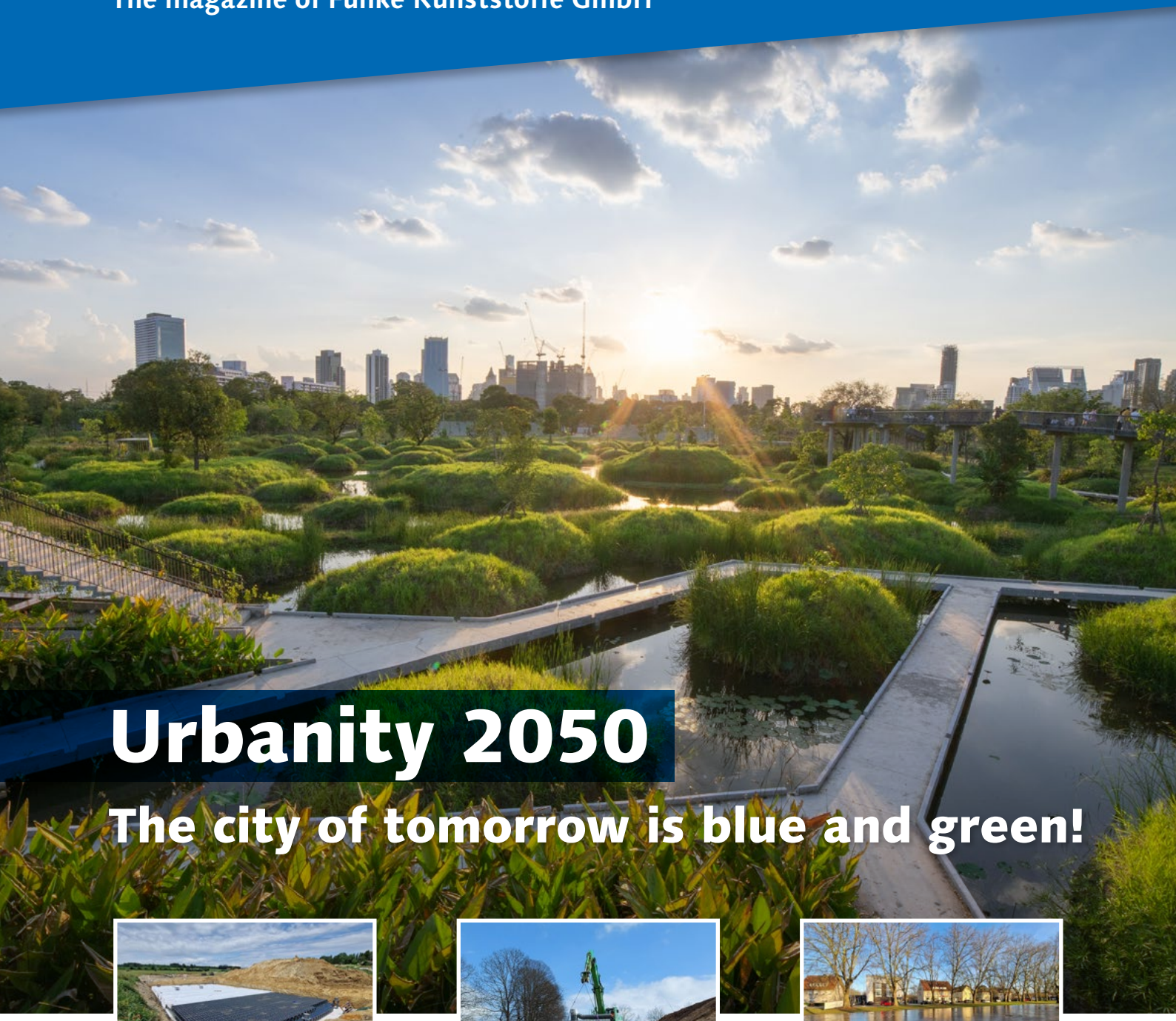
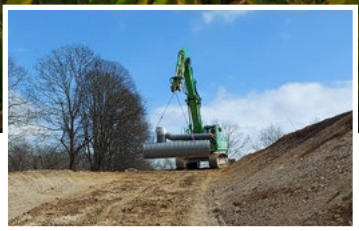
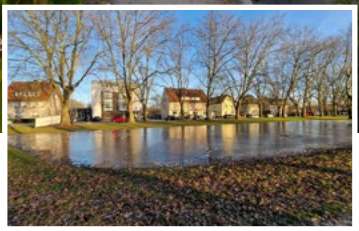
The magazine of Funke Kunststoffe GmbH



Urbanity 2050

The city of tomorrow is blue and green!





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Valuable resource
Infiltrate and save stormwater

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Sustainable handling
Treat stormwater in a targeted manner

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Healthy trees
For a better climate in urban space

Dear readers,

Climate change has already made its presence felt in Germany – and this will become much more acute in the future. In light of this development – particularly the increase in heatwaves and drinking water shortages, heavy rainfall and flooding – experts see enormous challenges ahead for the sewer infrastructure and, in turn, for network operators. In Central Europe, we must already reckon with very high variability in water demand and stormwater volumes – experts agree on this too. Among other things, it is important to make piped infrastructure and municipal drainage systems water-sensitive and adapt them constructively to the alternation between long periods of drought and intermittent heavy rainfall events. Strategic adaptation planning to the expected changes – for example, by optimising network operation in the form of further networking and digitalisation – seems to offer solutions here, as does the concept of a 'sponge city'.

With its modern and high-performance system solutions, Funke Kunststoffe can make a contribution this regard, to help create healthy and liveable environment in which people, infrastructure and urban greenery are protected. With the development and marketing of innovative products for tree protection and stormwater management, Funke offers tested and efficient solutions in line with the concept of a sponge city. The company engages closely with all relevant market players to identify additional challenges and develop targeted, market-oriented solutions.

Timo Langer
Head of Sales

Backround image: © Andriy Blokhin – stock.adobe.com

Special:
Funke-Schwammstadt®

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Thinking about the future

The city of tomorrow is blue and green!

Sudden heavy rainfall events and prolonged dry periods – these are the key challenges for the water industry of the future.

Stormwater management of tomorrow

A sewage network designed for exceptional cases is not cost-effective. We need a different approach to effectively counter the increasingly frequent heavy rainfall events and protect buildings and other infrastructure. Unsealing surfaces and the controlled release of stormwater will play an important role in the stormwater management of tomorrow. The focus here is on parameters such as infiltration, storage, treatment and evaporation.

More than 70 % of our drinking water comes from groundwater.

Climate change. Stress factors. Water problems.

Infrastructure and construction methods must be adapted. As a building block of targeted climate impact adaptation, so-called 'sponge cities' offer a viable solution for sustainable urban water management. The associated interdisciplinary concepts offer promising approaches to tackling the consequences of climate change and making cities more sustainable. Decentralised stormwater management systems are particularly important.

All-round carefree solutions made by Funke

However, to ensure successful structural implementation, many clever construction solutions are required. In this regard, companies such as Funke Kunststoffe GmbH have been offering innovative systems for pre-cleaning and treatment as well as for the infiltration or storage of stormwater for years. With their performance parameters and technical properties, these systems create the basis for dealing with the imponderables of nature in the best possible way and thus containing and minimising possible damage scenarios.

22. March

International World Water Day has been held every year on March 22 for 30 years.

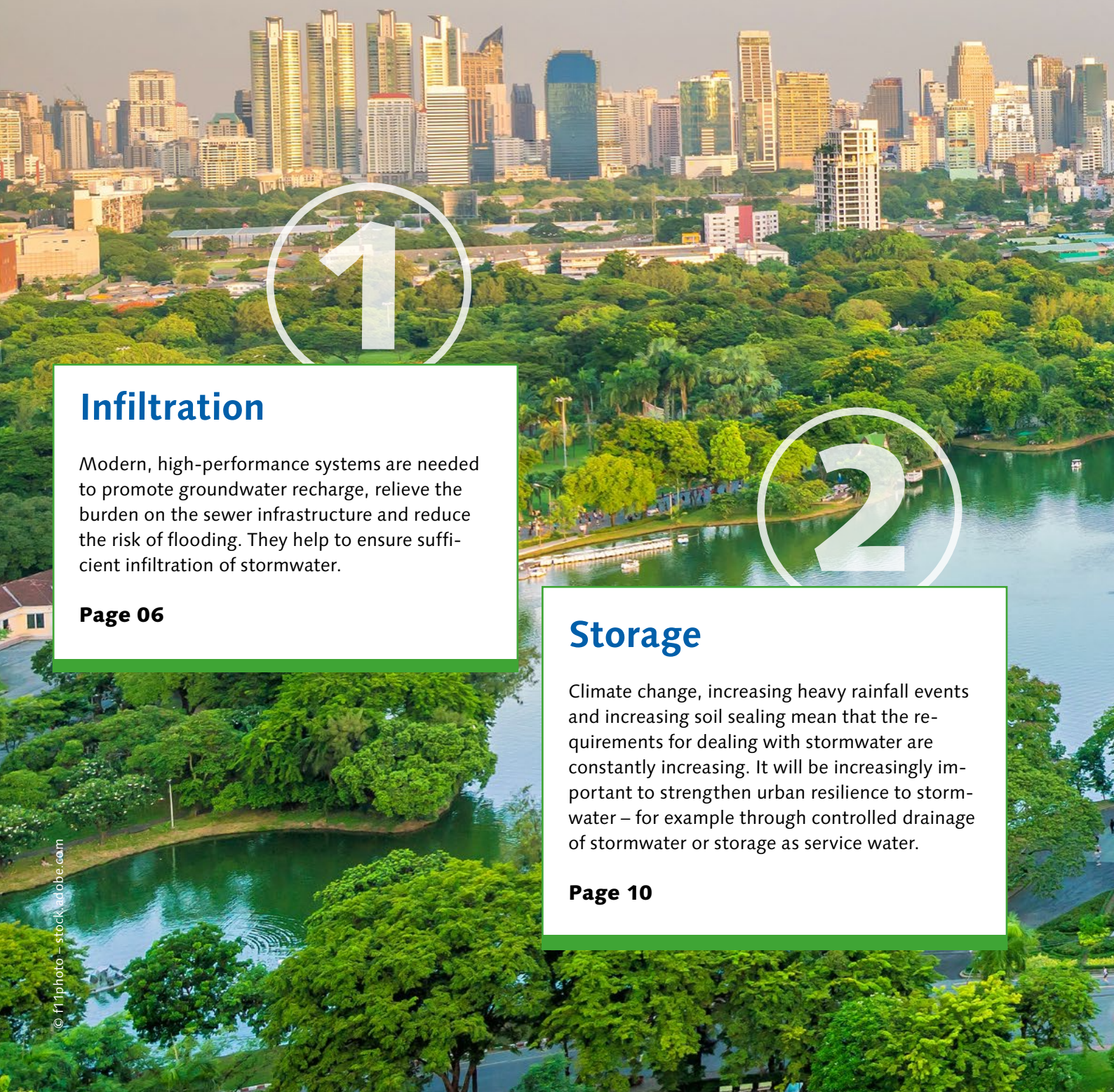
Funke Kunststoffe gets cities fit for the future

- Stormwater management
- Road drainage
- Tree protection
- Sewage and drainage pipe systems

Funke solutions

Future-oriented approach to stormwater

For years, Funke has been developing far-sighted and innovative solutions for all aspects of stormwater and sponge cities. Regardless of whether it's cleaning, infiltration, drainage or storage, with their performance parameters and technical properties, these systems create the basis for dealing with the imponderables of nature in the best possible way and thus containing and minimising possible damage scenarios. Funke products can all be combined with each other and therefore offer optimum solutions for every task.



1

Infiltration

Modern, high-performance systems are needed to promote groundwater recharge, relieve the burden on the sewer infrastructure and reduce the risk of flooding. They help to ensure sufficient infiltration of stormwater.

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Storage

Climate change, increasing heavy rainfall events and increasing soil sealing mean that the requirements for dealing with stormwater are constantly increasing. It will be increasingly important to strengthen urban resilience to stormwater – for example through controlled drainage of stormwater or storage as service water.

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3

Treatment

The development of effective and practical decentralised systems is an important part of stormwater runoff management. In particular, stormwater runoff from traffic areas, which contains substances such as heavy metals, mineral oil hydrocarbons and polycyclic aromatic hydrocarbons, is a major polluter of groundwater and other waterbodies.

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Evaporation

In view of climate change, trees have an important function, especially in urban areas. They provide shade and cool the surrounding air through water evaporation. To do this, however, they need sufficient nutrients, which are no longer available in the required quantities as a result of increasingly poor conditions. This is why the hydrologic balance of trees is a very high priority in many cities.

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Targeted infiltration

Stormwater management is a task for the future

Funke solutions: Infiltration

- **The D-Raintank 3000® system stores stormwater and releases it successively into the surrounding soil in three dimensions.**
- **The D-Raintank 3000 smallbox® was designed for space-saving and flat installation. The structural properties correspond to those of the standard version.**
- **The D-Rainclean® Filtration Channel collects contaminated stormwater from roads, car parks, yards and roofs and releases it into the ground in a harmless state.**
- **The D-Rainclean®-Box is a system that treats polluted surface runoff.**

For a long time, stormwater was collected and drained away as quickly as possible. Today, the aim is to capture, collect and process the water. It can be retained, stored or made usable again via drainage chambers and pumping systems. There is also the possibility to allow stormwater to infiltrate underground if there is not enough space or possibilities above ground.

Resilient handling of precipitation water through infiltration or throttled discharge is necessary in order to relieve the sewer system and reduce hydraulic stress in waterbodies. Surface water should be discharged in as controlled a manner as possible and reused sensibly and sustainably. In addition, unsealing impervious surfaces and the local infiltration of surface water will play an even more important role in the stormwater management of tomorrow. Studies show that around 14.5% of the total area in Germany is settlement and traffic areas. Most of these areas are built on, concreted, asphalted, paved or otherwise hard-surfaced. As a result, important soil functions such as water permeability and soil fertility are lost. With the expansion of settlement and traffic areas, soil sealing continues to increase. This has a direct impact on the

Infiltration trenches comprised of D-Raintank 3000® elements

hydrologic balance. Among other things, stormwater can no longer infiltrate unhindered and replenish the groundwater reserves. In addition, the risk of local flooding increases, as the sewage system or receiving watercourses are unable to cope with the surface water runoff during heavy rainfall. Accordingly, technical solutions for retention and infiltration will continue to gain in importance. With this in mind, Funke Kunststoffe GmbH has been developing innovative solutions such as the D-Raintank 3000®, the D-Raintank 3000 smallbox® and the D-Rainclean® Filtration Channel for years.

Professional planning is essential

The german worksheet DWA-A 102 stipulates the "preservation of the natural hydrologic balance" as a key objective when planning drainage concepts. The variables of runoff, groundwater recharge and evaporation should be approximated to the natural reference state of the area requiring planning. For the purpose of groundwater recharge, facilities for stormwater infiltration are often necessary. The german worksheet DWA-A 138-1:2020-11 – "Design of systems for stormwater infiltration - Part 1: Planning, construction, operation" provides guidance for structural planning.

The worksheet deals with various infiltration options:

- **surface infiltration** comes closest to natural infiltration
- with **trough infiltration**, the stormwater is collected in a depression and provisionally stored
- a **trough-trench infiltration system** increases the storage volume; it is suitable for less permeable soils and/or unfavourable space conditions
- **trench infiltration** – gravel, pipe-gravel or plastic block infiltration trenches – is a space-saving underground form of infiltration in which pre-cleaning of the stormwater is absolutely essential
- **chamber infiltration** involves selective discharge into the groundwater via a substrate layer.

The focus is also on the following parameters:

- permeability of the soil: kf-value between $1x10^{-3}$ and $1x10^{-6}$ m/s
- precipitation water may only be discharged into the groundwater in a harmless state
- harmless stormwater runoff can be infiltrated without pre-treatment
- tolerable stormwater runoff only with suitable pre-treatment
- intolerable stormwater runoff either directly into a sewage treatment plant via the sewer system or through suitable pre-treatment
- drinking water protection areas must be considered separately
- infiltration via suspected contaminated sites is not possible
- the minimum distance to buildings must be maintained
- the possibility of whether landslides can occur must be looked into

If infiltration is not possible, the stormwater must be collected and drained. To avoid hydraulic stress, this is usually throttled. If the k_f-values are unfavourable, a combination of drainage and infiltration is possible.

Formula for the hydrologic balance:

$$P = R_D + GWN + ET_a$$

Precipitation (P) is converted to runoff (RD) + Groundwater recharge + evaporation (ETa)

Infiltration

Funke solutions in practice

Fürth (Germany)

During the construction of a production hall on a company site, a drainage concept was implemented in which the water running off the sealed parking and traffic areas can infiltrate gradually and in a harmless state in future. This is a very powerful, modern drainage system.

Special feature: **Design of a drainage system under parking and traffic areas**

Funke systems: D-Raintank 3000®, D-Rainclean® Filtration Channel, Funke Filtration Chamber, HS® Cleaning Chamber

Scope of services: three infiltration trenches and 25 m D-Rainclean® Filtration Channel

Elchingen (Germany)

The development area at Thalfingerstraße, which is located in a depression, was protected against flooding during heavy rainfall events by equipping it with a large-scale infiltration system.

Special feature: **Infiltration system for infiltration with upstream sedimentation basin made of concrete**

Funke system: D-Raintank 3000®

Scope of services: Construction of an infiltration trench with a capacity of 804 m³

Herxheim (Germany)

Implementation of a concept for the local infiltration of stormwater in the new development area "An der Augustastraße". For the drainage development of the 3.7-hectare new construction area, nearly 8,000 D-Raintank 3000® elements were installed.

Special feature: **Trough-trench system for infiltration, with k_f- value of $7x10^{-7}$ m/s**

Funke system: D-Raintank 3000®

Scope of services: Construction of an infiltration trench consisting of 7,750 elements (1,623 m³) and a trough with a volume of 2,850 m³

Oberkirch (Germany)

During the expansion of a company site with a 4,500 m² dispatch hall, the focus of the planning was on modern stormwater infiltration. By constructing a trough with D-Rainclean® substrate, the client opted for a cost- and space-saving option. The stormwater is reliably cleaned of pollutants as it flows through the substrate.

Special feature: **Treatment and infiltration, replacement for conventional infiltration troughs, less space required**

Funke system: D-Rainclean®-Substrat

Scope of services: 200 m³ substrate

Achern (Germany)

For the drainage of a department store car park, a trough was excavated between the parking areas and filled with substrate. An additional storage space made of D-Raintank® elements under the substrate trough ensures continuous infiltration of the stormwater.

Special feature: **Alternative solution for conventional infiltration trenches, significantly less space required (3 % instead of 15 % of the surface area)**

Funke systems: D-Rainclean® Substrate, D-Raintank® Elements

Scope of services: 90 D-Raintank® Elements and trough with D-Rainclean® substrate

Gernsheim (Germany)

The D-Rainclean® Filtration Channel was installed for decentralised drainage of a newly constructed car park at a medical centre. The stormwater is directed into the channel and treated as it flows through the substrate before infiltration.

Special feature: **Car park drainage with treatment and infiltration**

Funke system: D-Rainclean® Filtration Channel

Scope of services: approx. 100 m D-Rainclean® Filtration Channel

„With a volume of 2,850 m³, the infiltration trench in the new development area of Herxheim is sufficiently dimensioned and the difficult conditions on site have been satisfactorily resolved."

Dipl.-Ing. Christiane Mairon,
Karlsruhe Engineering Office for Civil Engineering fmz

Innovative solutions for dealing with stormwater

Collect, store and use in a targeted manner

Funke solutions: Storage

- **The D-Raintank 3000® in combination with a seal (PE membrane) is a system that can store stormwater with a high storage coefficient of 97 %.**
- **The KS-Bluebox® consists of factory-made plastic-coated D-Raintank 3000®-Elements in which stormwater can be permanently stored. For example, as an underground extinguishing water tank in accordance with german DIN 14230. The system can also be used as a retention volume.**
- **The irrigation of tree sites, especially in urban areas, can also be optimised with the use of a Funke Sedimentation Unit with a downstream KS-Bluebox®.**
- **HS® or CONNEX sewer pipes in large nominal widths can be used as storage sewers.**

The temporary storage of stormwater is a central component of drainage planning as part of sponge city concepts. The aim must be to store stormwater during periods of high precipitation so that it can be used to maintain green infrastructure during periods of low precipitation. This not only promotes evaporation in urban areas, but also favours the creation of a pleasant microclimate.

Storage solutions

There are various systems for storing stormwater. With the D-Raintank 3000®, large storage volumes can be created in almost any height and dimensions, which are covered and sealed on site with geotextiles and a PE membrane.

The same applies to the KS-Bluebox®, which consists of D-Raintank 3000® elements that are plastic-coated at the factory. In addition, HS® or CONNEX Sewer pipe systems to create storage channels.

The following key factors apply to the successful implementation of a sponge city concept:

Redesign of Franziskanerplatz in Erkelenz - improvement of climatic conditions in the urban area

Cascading systems

Cascading drainage systems are required to retain stormwater in urban areas. Such a system consists, for example, of a combination of green roof, cistern and subsequent infiltration. The series of systems delays the runoff, which reduces the risk of heavy rainfall. In addition, considerable quantities of stormwater can be retained, which can evaporate via the green roof, be taken from the cistern and used for irrigation or form groundwater again via the infiltration system.

Creative planning

In addition, considerable quantities of stormwater can also be retained, which evaporates via a green roof or is taken from a cistern and stored in a stormwater tank, can be used for irrigation or contribute to groundwater recharge via the infiltration system.

Planning must aim to creatively combine the various measures in order to achieve maximum water management benefits.

Multifunctional systems

Multifunctional planning of urban drainage systems and structures can maximise their benefits. To achieve this, these systems have to fulfil several functions at the same time.

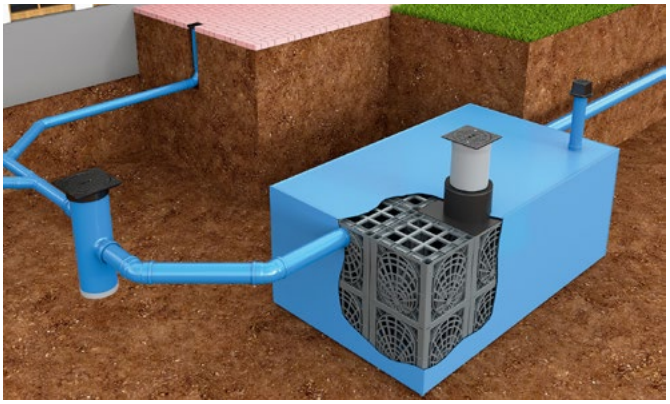
A KS-Bluebox® can store up to 50 m³ of water.

For example, stormwater retention areas can be planned in a way that gives them a retention and a management volume. Of course, the quality of the stormwater must be taken into account *(see also the "Treatment" section)*. This approach is not only important for large buildings, but also unleashes its potential when it is consistently implemented on properties with what are known as retention cisterns.

Use of sensor technology

Increasing digitalisation makes it possible to equip storage chambers with measurement technology – such as IoT sensors – and generate measured values in real time. This provides the owner or operator with information on the fill level of the system.

However, the sensor technology can also be used to implement an intelligent control system that reacts to current precipitation forecasts and enables maximum utilisation of the available storage volume.



For the retention, storage and use of stormwater: KS-Bluebox® – consisting of factory-made plastic-coated D-Raintank 3000® Elements

Storage

Funke solutions in practice

Wedemark (Germany)

Under the outdoor facilities of a school in the municipality of Wedemark, Hanover region, stormwater from the roof areas of the nearby town hall is temporarily stored in two elongated KS-Bluebox® Elements with a total usable storage volume of 40 m3. The stormwater is pre-cleaned in an HS® DN/OD 800 Cleaning Chamber. A small IoT sensor was installed under the cover of an inspection block, which records the water level in the system at regular intervals and transmits the data to a server in real time. The municipal building yard, which is responsible for watering the trees in the outdoor facilities, can check the fill level at any time via a dashboard and assess whether there is sufficient stormwater for the next watering.

Special feature: **Storage with level measurement**

Funke systems: KS-Bluebox®, HS® Cleaning Chamber DN/OD 800

Scope of services: Water reservoir with a total usable storage volume of 40 m³

Lörrach (Germany)

The stormwater that falls on a residential complex in Lörrach is drained via a combination of D-Raintank 3000® infiltration systems and KS-Bluebox® Elements. The system was designed so that the infiltration systems only fill with water when the KS-Bluebox® is filled up to the top edge. Water can be extracted for drainage purposes via an adjacent pump chamber.

Special feature: **Multifunctional system with maximum stormwater storage**

Funke systems: D-Raintank 3000®, KS-Bluebox®

Scope of services: 31 m³ storage tank for stormwater utilisation, infiltration system with 45 m³ volume, pre-cleaning via four DN/OD 400 Cleaning Chambers

"The system made from KS-Bluebox®-Elements is an important step towards climate resilience. And it's intelligent to boot."

Ralf Grewecke,
Gemeindewerke Wedemark GmbH (Germany)

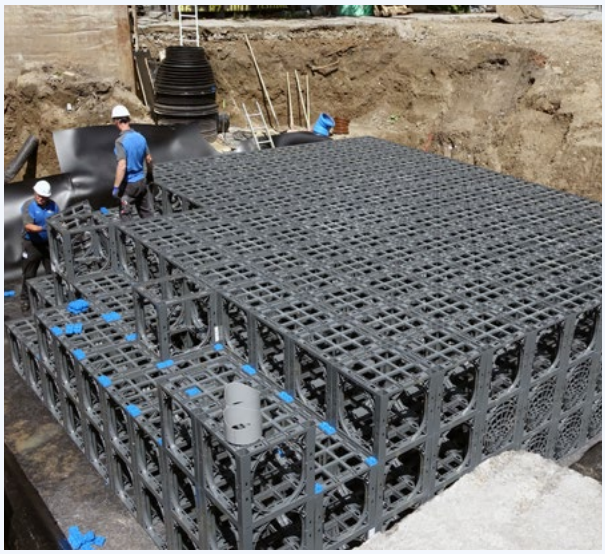
Erkelenz (Germany)

The redesign of Franziskanerplatz in Erkelenz has upgraded the city centre area. Among other things, water play elements and green spaces were intended to make the square more attractive for families and improve the quality of their stay. The water features are operated with stormwater, which is stored in four KS-Bluebox® elements. The stormwater in the KS-Bluebox® elements is also used to irrigate the newly laid green areas. For Franziskanerplatz, this will have significant benefits for the local climate: the green spaces will be preserved, and it will be much more pleasant to spend time there even on hot summer days thanks to the shade and evaporative cooling.

Special feature: **Improvement of climatic conditions in the urban area**

Funke system: KS-Bluebox®

Scope of services: Installation of four KS-Bluebox® Elements, each measuring 12.0 m x 1.8 m x 2.4 m (L x W x H) and each with a capacity of 50 m³



Göttingen (Germany)

The drainage system was also renewed as part of the core refurbishment of the Stadthalle Göttingen. Due to a requirement of the drainage company, it was necessary to plan a retention system for the stormwater. Here, the concept of multifunctionality was successfully implemented by using the D-Raintank 3000® Elements to construct a three-layer storage tank, of which the lower two layers serve as a storage tank for stormwater utilisation (58 m3) and the upper layer as a retention volume (33 m3). Before the stormwater enters the D-Raintank 3000® system, it is pre-treated in a Funke DN 1000 Sedimentation Unit.

Special feature: **Multifunctional system**

Funke systems: D-Raintank 3000® Elements, Funke Sedimentation Unit DN 1000

Scope of services: 58 m³ storage tank for stormwater utilisation; retention volume of 33 m³

Efficient stormwater management

Treat stormwater in a targeted manner

Funke solutions: Treatment

- **The Funke Sedimentation Unit and the Funke Sedimentation Chamber were designed for treating stormwater runoff before it is discharged into surface waters.**
- **The D-Rainclean® Filtration Channel – a combination of a filtration channel and a substrate – offers a professional solution for dealing with contaminated surface runoff. The same is true of the D-Rainclean® box.**
- **When flowing through the Funke Filtration Chamber, more than 95 % of the sediments and dissolved and undissolved pollutants contained in the stormwater are retained.**
- **INNOLET® is a retrofit kit for kerb gullies in accordance with DIN 4052 that filters pollutants out of precipitation before it is discharged into waterbodies. The INNOLET®-G can be used to equip kerb gullies with a wet sludge trap.**

In stormwater runoff management, the development of effective and practical concepts based on decentralised systems is an important component in planning carried out by municipalities and network operators.

According to Section 55 of the German Federal Water Act (WHG), "precipitation water should be infiltrated close to the site, trickled or discharged directly into a waterbody via a sewer system without mixing with wastewater, provided that neither water law nor other public law regulations nor water management concerns stand in the way of this". The unsealing of impervious surfaces and the local infiltration of surface runoff will therefore play an even more important role in the stormwater management of tomorrow than they do today.

Areas of origin and substances

Stormwater runoff collected from paved surfaces such as roofs, car parks and traffic areas is defined as wastewater by the german Federal Water Act. Stormwater runoff carries a wide variety of dirt particles in dissolved and bound form into the sewer system.

Installation of a Funke Sedimentation Unit

Enriched with harmful substances

The concentrations of particulate, dissolved and finely particulate bound substances occurring in runoff can affect groundwater and surface water. For this reason, the focus is on fine solid particles, among other things, to which trace substances and heavy metals can be bound in high concentrations. The total suspended solids < 63 µm (SS63) serve as parameters for their detection.

These are the very fine fractions to which a wide variety of pollutants adhere due to their relatively large specific surface area. The stormwater runoff is assigned to different area categories in relation to SS63 concentration values. An estimate of the SS63 load washed off per year determines whether and to what extent the stormwater should be treated (see also german worksheet DWA-A 102/BWK-A3, December 2020 and german worksheet DWA-A 138-1, draft November 2020). In addition, the surface runoff contains heavy metals and organic pollutants in dissolved form that are not bound to any particles. These can be removed from the surface runoff using processes such as adsorption or precipitation.

These include, for example:

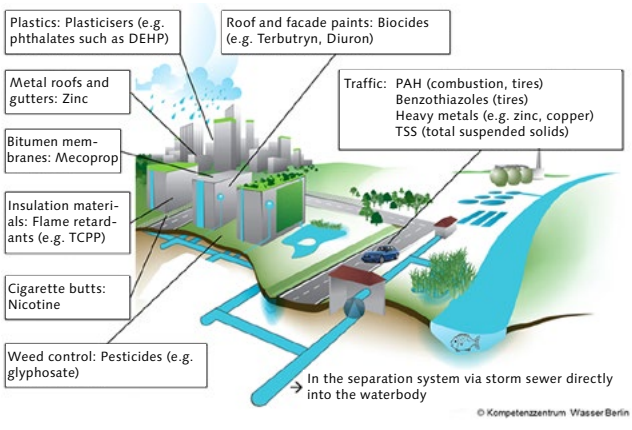
- tire and brake abrasion (heavy metals such as zinc, copper, chromium, also microplastic particles)
- abrasion of roadways
- drip oil losses from vehicles (MOH)
- pollutants from the deposition of particulate matter
- erosion of roof and facade surfaces (biocides such as Terbutryn, Diuron, Mecoprop)
- intrusions from agricultural activities (e.g. fertilisers and weed killers).

Innovative plastic solutions

Depending on the degree of pollution and the sensitivity of the target water body, it is often necessary to treat the stormwater runoff. The aim here is to analyse climatic events, implement standards and offer suitable products for dealing with contaminated stormwater.

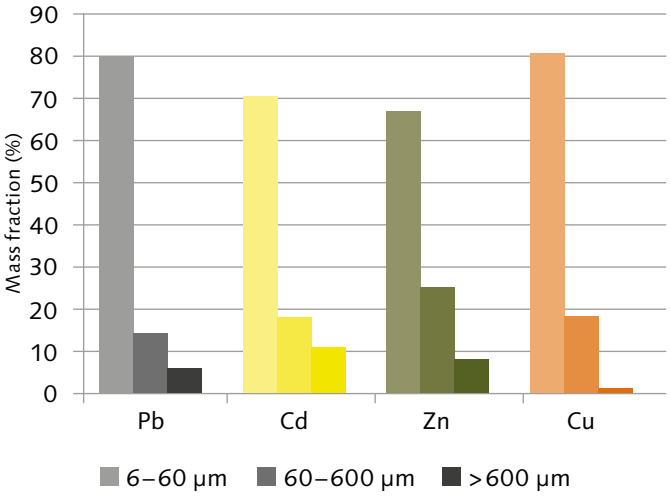
To this end, Funke offers practicable solutions that enable the infiltration, purification, storage or use of precipitation as close to the source as possible, as required by law. They can also be used economically and sustainably and offer excellent solutions for sustainable concepts such as the "sponge city principle".

Water pollution in urban areas



Source: Kompetenzzentrum Wasser Berlin (KWB)

Pollutant transport at TSS particle sizes



Pb = lead; Cd = cadmium; Zn = zinc; Cu = copper

(Source: Schmitt 2021, p. 11)
Schmitt, Theo (2021): "Emissions from stormwater runoff": Material pollution of precipitation water - reference parameters SS63 and pollution categories by area of origin, [Web seminar January 27/28, 2021]

≥ 95 %

of pollutants are retained in the Funke Filtration Chamber.

Regulations

The most important german laws and technical regulations for the field of stormwater treatment are listed below:

- **Federal Water Act (WHG):** The WHG is the central law for the management of waterbodies in Germany. Among other things, it regulates the requirements for the discharge of stormwater into waterbodies and sets the framework conditions for handling stormwater.

- **State-specific regulations:** The federal states flesh out and supplement the WHG. State water laws and state-specific decrees may contain corresponding requirements for stormwater treatment.

- **German Association for Water, Wastewater and Waste (DWA) regulations:** The DWA worksheets represent recognised rules of technology. In the area of decentralised treatment in residential areas, DWA-A 138-1 (currently in draft form; white print will replace DWA-M 153) is mainly relevant for discharge into groundwater and DWA-A 102-2 for discharge into surface waters.

- **Other regulations:** Another application is, for example, the drainage of traffic routes outside of residential areas. The German Road and Transportation Research Association (FGSV) guidelines for the drainage of roads (REwS) serve as a guideline for this.

This document is a translation of the German brochure. All mentioned authorisations and standards pertain to those in Germany. For details on the corresponding authorisations and standards in your country, please contact us.

Action mechanisms of stormwater treatment

Sedimentation	Sinking of organic and mineral particles in the water
Filtration	Retention of particles in the pores of a filter substrate (= depth filtration) or retention of particles by sieving (= surface filtration)
Adsorption	Accumulation of dissolved substances on materials with a highly porous structure and large inner surface area through intermolecular binding forces
Ion exchange	Storage of ions dissolved in water in a natural material with simultaneous discharge (= exchange) of other ions from the ion exchanger into the water
Precipitation	Chemical reaction in which dissolved substances are converted into particulate form
Biodegradation	Degradation of substances by microorganisms

Overview of Funke systems for stormwater treatment

System		INNOLET®	INNOLET®-G	Sedimentation Chamber	Sedimentation Unit	Funke Filtration Chamber	D-Rainclean® Filtration Channel	D-Rainclean® box
Application area		Irrigation gully insert	irrigation gully insert	chamber system	horizontal sedimentation unit	chamber system	filtration channel	filter box
Stormwater catchment area up to		250 (400) m²	250 m²	3.000 m²	5.000 (9.000) m²	600 m²	20 m² per running metre.	40 m² per running metre.
Permeability level according to german DWA-M 153 (recommendation)		0,5	0,4	0,35	0,3	0,15	0,15	0,15
Retention TSS, SS63 according to DWA-A 102	AFS	65 %	75 %	70 %	72 (62) %	96 %	99 %	99 %
	AFS63	47 %	52 %	50 %	55 (47) %	>80 %	>80 %	>80 %
Approvals		LANUV list	LANUV list	–	–	DIBt approval Z-84.2-19	DIBt approval Z-84.2-1	DIBt approval Z-84.2-32

For UK Indices contact Funke at info@funkegruppe.de.

Action mechanisms of stormwater treatment

Stormwater treatment makes technical use of natural processes. Despite a wide range of possible solutions, various aspects and questions need to be taken into account. Where do the different pollutants come from, and how do different areas of origin influence the occurrence of pollutants in stormwater runoff? In addition, suitable action mechanisms must be selected on the basis of the pollutant levels. It will be important to plan systems that provide the best possible conditions for the action mechanisms. For example, the sedimentation of particles in water depends on parameters such as the diameter of the particles as well as the density and the current. Small organic particles sediment much more slowly than large mineral particles. High flow velocities in treatment plants can lead to particles not settling as they pass through the plant or to particles that have already settled being set in motion again and discharged. Furthermore, dissolved substances can only be converted into a separable (particulate) form by precipitation or bound to materials and retained by adsorption and ion exchange.

Decentralised solutions

Sedimentation systems and hydrodynamic separators are available as decentralised solutions, as are systems with filter substrates or combinations. They are characterised by their proximity to the areas on which stormwater runoff occurs (see german DWA-A 102-2, p. 35) and are generally suitable for stormwater catchment areas of up to 10,000 m².

System types

The systems differ in terms of their design (road drains, channels, chambers, other designs), the mechanisms of action and efficiencies as well as the approval (with/without DIBt approval – the highest seal of quality for systems in Germany).

Sedimentation units

Sedimentation units are used to treat stormwater and retain solids and light materials. As a rule, surface loading and flow velocity are used as parameters to estimate particle retention. With the help of installations – such as lamellas – the effective sedimentation surface area of a unit can be increased and uniform flow conditions created, which increases particle retention. However, the flow routing within a system is also of particular relevance. This allows induced rotational movements to contribute to better separation of particles. When planning, particular attention should be paid to preventing high flow rates due to intensive rain events, in order to rule out remobilisation of particles that have already been deposited. This can be achieved by a sensible arrangement of a throttle and an emergency overflow or by a float-controlled feed of the system, such as in the Funke Sedimentation Unit.

Filter systems

Decentralised filter systems generally use technical filter substrates, and occasionally also sieves. Depending on their composition and properties, the filter substrates Grain fractions have a certain hydraulic permeability (Kfvalue). High permeabilities are ideal for a stout and compact design. Lower permeabilities, on the other hand, lead to longer contact times and better

85 %

of SS63 was retained by the D-Rainclean® Filtration Channel in a field trial lasting several years.

D-Rainclean® field trial

Location	Lemwerder, Lower Saxony, single-lane country road L 875
AADT	2010: 6900 vehicles/24h, SV 200 (> 3.5 t) 2021: 6300 vehicles/24h, SV 400 (> 3.5 t)
Category DWA-A 102-2	Cat. II, area group V2
Precipitation	705 mm/a
Filter-area ratio	1 m² filter surface / 40 m² area corresponds to 1 running metre. Trough / 12 m² area
Installation of the test facility	November 2012
DIBt approval	Z-84.2-1
Other	Use by agricultural vehicles, use of road salt in winter

The D-Rainclean® Filtration Channel is being tested under real conditions in a field trial in Lemwerder (Germany)

results with regard to the retention of dissolved substances. It should be noted that the initial permeability of a substrate decreases with operation and increasing particle loading. For hydraulic design, such as that of filter channels, an operational permeability based on long-term empirical data should always be used

Against this backdrop, Funke's substrates create an optimum compromise between permeability, durability and high pollutant retention. This has been proven in a long-term field trial (see section Field Trial). Filter systems should be planned for stormwater treatment applications in a way that ensures they are only dammed up temporarily when runoff is present. In the case of permanently dammed substrates, there is a risk that adsorbed pollutants will dissolve and be discharged again with the next precipitation event.

Combined systems

Systems that combine sedimentation and filtration are particularly important for the treatment of medium to heavily polluted stormwater runoff. By retaining particles in an upstream sedimentation stage, the downstream filter stage is relieved and protected from siltation. As a result, long service lives of the filter stages can be achieved with high levels of efficiency.

Research
D-Rainclean® field trial

In a field trial on a D-Rainclean® Filtration Channel (see table on the left), which has now been running for more than eleven years, the main aim is to investigate how reliably the system functions under real operating conditions. At the same time, the retention of selected pollutants is monitored over a period of several years. During the test period, 71 rainfall events have so far been recorded and evaluated in the inlet and outlet of the D-Rainclean®-Filtration Channel. For example, TSS, SS63, lead, cadmium, copper, zinc, hydrocarbon index, total phosphorus, COD, PAH, electrical conductivity, pH value and turbidity.

A high particle load (TSS & SS63) was detected. The contamination with other parameters (copper, zinc, MOH, PAH) was moderate.

On a long-term average, the requirements of the DIBt approval principles regarding the retention of TSS, MOH and heavy metals are met.

SpurClean

In urban areas, run-off stormwater can be contaminated by organic trace substances such as biocides, plasticisers and flame retardants. These substances are washed away by rain from building surfaces such as facades and roofs as well as from traffic areas and, depending on the weather and urban structure, can enter waterbodies in untreated form via the stormwater drainage system.

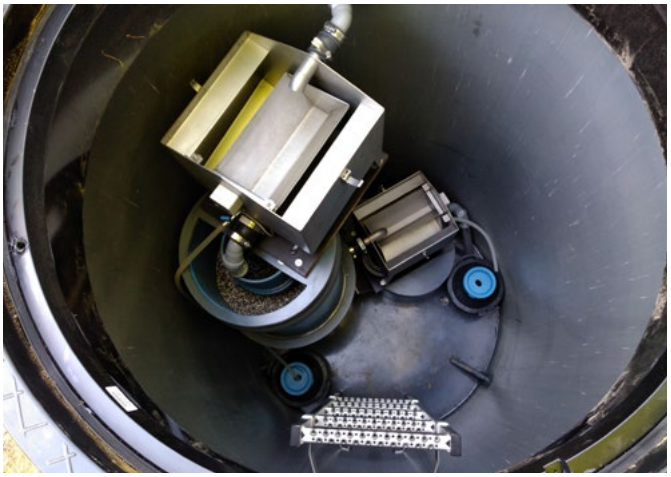
Based on findings from other projects of KWB (Kompetenzzentrum Wasser Berlin) and UMTEC (Institute of Environmental and Process Technology; Eastern Switzerland University of Applied Sciences, Switzerland), the project SpuR (development of a biocide-minimised facade protection system and stormwater treatment with adsorber mixture to reduce trace material intrusion from urban areas into water bodies) aimed to demonstrate strategies and specific technical measures that can be used to reduce such intrusions. Funke Kunststoffe was involved as a project partner *(source: Kompetenzzentrum Wasser Berlin)*.

Stormwater runoff from
- Facades (paints & plasters contain persistent algicides with high ecotoxicological impact Terbutryn, Diuron)
- Roofing membranes (may contain, for example, root penetration inhibitors (Mecoprop) or vulcanisation accelerators (Benzothiazole) in EPDM membranes)

Funke's newly developed SpurClean was used in the tests. In addition to solids and metals, dissolved organic trace substances can also be retained. The technology was used in urban areas under real conditions in a decentralised stormwater treatment system and the retention of substances was quantified.

Microplastics

Microplastics from traffic areas account for approx. 39.1 % of primary microplastic emissions (Fraunhofer UMSICHT 2018 consortium study), tire abrasion accounts for approx. 30.7 % of total primary MP emissions.
A series of laboratory and field trials with the D-Rainclean® Substrate and the D-Rainclean® Filtration Channel resulted in a retention of microplastics of more than 99 % *(see gwf-Water/Wastewater, issue 11/2023, p. 83 ff.)*.

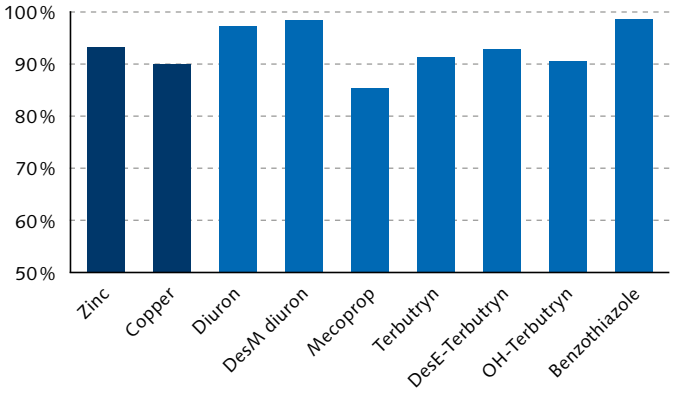


Pilot plant as part of the Spur-Projects

SpurClean – bench scale test

Implementation of a bench scale test over a total of 24 months
- 150 m² freshly-made vertical wall surface
- 5 m² of gravel roof with root-resistant bitumen membrane
- 5 m² gravel roof with EPDM membrane (rubber)
- 9 m zinc channel b = 0.2 m (approx. 1.8 m² wetted)
- 9 m copper channel b = 0.15 m (approx. 1.35 m² wetted)

SpurClean – Efficiency



Source: Kompetenzzentrum Wasser Berlin (KWB)

Treatment

Funke solutions in practice

Bad Tölz (Germany)

As part of a supermarket refurbishment in Bad Tölz, the car park was also completely renovated. Various existing trees were preserved.

The car park areas are drained entirely via D-Rainclean® Filtration Channels. The stormwater is treated decentrally and then infiltrates. This benefits the local hydrologic balance and also the irrigation of the existing trees.

Special feature: **Car park drainage via D-Rainclean® Filtration Channel**

Funke system: D-Rainclean® Filtration Channel

Scope of services: approx. 1,200 running metres.

Germaringen (Germany)

In Germaringen, the development of the construction area Ketterschwang was made possible with a Funke Sedimentation Unit and a KS-Bluebox®. With the sedimentation unit and the flushing pipes contained in the KS-Bluebox®, a large proportion of the particles contained in the stormwater are retained and not even fed into the retention system.

Special feature: **Compact design**

Funke systems: Funke Sedimentation Unit, KS-Bluebox®

Scope of services: 50 m^3 retention

Mannheim (Germany)

In Mannheim, the rainwater from Donar and Walkürenstrasse has been treated for thirteen years via lateral D-Rainclean® Filtration Channels and infiltrated locally. By implementing this construction measure, the municipal drainage company could ensure that the stormwater runoff from the existing streets was disconnected from the sewerage system.

Special feature: **Disconnection of residential areas from the sewerage system**

Funke system: D-Rainclean® Filtration

Scope of services: approx. 200 running metres.

„The saturation and chemical load of the substrate were examined internally in the laboratory for the first time after five years. No abnormalities were detected."

Tanja Teichert,
Mannheim Municipal Sewage Company (EBS)
(Germany)

Hanau (Germany)

For the conversion and expansion of the industrial estate roads in the Hanau Technology Park, it was planned to treat stormwater from the almost 6,000 m² of traffic areas and subsequently discharge it into the Doppelbiergraben at a reduced rate. In addition to four KS-Blueboxes with a total retention volume of 152 m³, Funke was able to design a two-stage stormwater treatment system that treats stormwater from category III areas (in accordance with german DWA-A 102-2) first by sedimentation and then filtration via the D-Rainclean® substrate.

Special feature: **Custom-made filter system for treatment of category III surfaces**

Funke systems: Funke Sedimentation Unit, underground filter system with D-Rainclean® substrate, KS-Bluebox®

Scope of services: 152 m³ retention

Berlin (Germany)

In the Theodorpark development area in Berlin Marzahn-Hellersdorf, the roof surfaces of 70 detached houses were drained using D-Rainclean® Filtration Channels in 2014. Because the area is located in a water protection zone, there were high requirements for the qualitative protection of the groundwater during planning and implementation. With the help of the D-Rainclean® Filtration Channel, these requirements could be met. At the same time, it was ensured that the local water cycle is foster over the long term.

Special feature: **Connection of the roof drainage to the D-Rainclean® Filtration Channel**

Funke system: D-Rainclean® Filtration Channel

Scope of services: 280 running metres.

Kassel (Germany)

For 14 years, the stormwater from the roof and traffic areas of an industrial plant in Kassel has been treated with D-Rainclean® substrate via a large-scale treatment trough before it infiltrates into the ground. The filter substrate enables high and reliable retention of pollutants. At the same time, the filter substrate has a higher permeability than a vegetated topsoil, which means that the treatment stage requires less space.

Special feature: **Drainage and treatment**

Funke system: D-Rainclean® substrate

Scope of services: approx. 45 m³ substrate

Better climate in urban areas

The environment benefits from healthy trees

Funke solutions: Evaporation

- **Systems such as the D-Rainclean® Filtration Channel, INNOLET®-G and the KS-Bluebox® can be used to clean or store stormwater runoff.**
- **The Bewa® Irrigation Gully makes it possible to switch between summer and winter operation when irrigating a tree site, thus preventing the inflow of road salt.**
- **The Funke Tree Root Vent ensures that the roots are supplied with air as well as water and nutrients.**
- **The Funke Tree Irrigation Angle supplies the root area of the tree with water and nutrients in a targeted manner.**
- **The Funke Irrigation Ring ensures that freshly planted trees are sufficiently supplied with water during the growth phase.**

Across the world, temperatures are on an upward trend. This rise in annual temperatures is accompanied by increasingly long periods of drought. This is why the hydrologic balance of trees is high on the agenda in many cities.

Trees make cities green, provide shade in summer and ensure good air quality. Without urban greenery, it would be (even) hotter in large cities during the warm season and residents would be more exposed to emissions and the risk of flooding.

Tree stress is increasing

As important as trees are for the microclimate, air and hydrologic balance in large cities, their living conditions are often poor. Urban trees have to contend with a lack of space, planting pits that are too small as well as soil sealing and compaction, which literally deprive them of air to breathe and can also lead to insufficient water supply. The vibrations from passing vehicles increase soil compaction, exacerbating the problem. In addition, there is pollution from exhaust fumes, dog faeces, road salt and artificial light as well as frequent damage to the roots and injuries to the bark.

Multifunctional surfaces can safely store stormwater for a short time during heavy rainfall

Strains due to climate change

According to the German Weather Service (DWD), 2023 was the warmest year recorded in Germany and globally since regular measurements began in 1881. In addition, the years 2013 to 2022 were the warmest ten-year period since the analysis began. Since the 1970s, every decade in Germany has been warmer than the previous one. Experts expect temperatures to rise further. While the temperature barometer tends to rise, the annual amount of precipitation tends to fall. According to the DWD, regional precipitation in 2020, for example, was 84 mm below the average for the years 1961 to 1990.

Water shortage despite heavy rain

Too warm and too dry – climatic changes are a massive problem for the vitality of urban trees. A lack of precipitation combined with high temperatures leads to a lack of water running through several layers of soil – in such an event, this is referred to as drought. The soil becomes hard and encrusted and increasingly loses its ability to absorb water. The precipitation, which is anyway frequent, short and heavy in summer, evaporates quickly, then runs off on the surface without seeping into the ground. While cellars and sewers fill up in the event of heavy rainfall, trees continue to suffer from a lack of water.

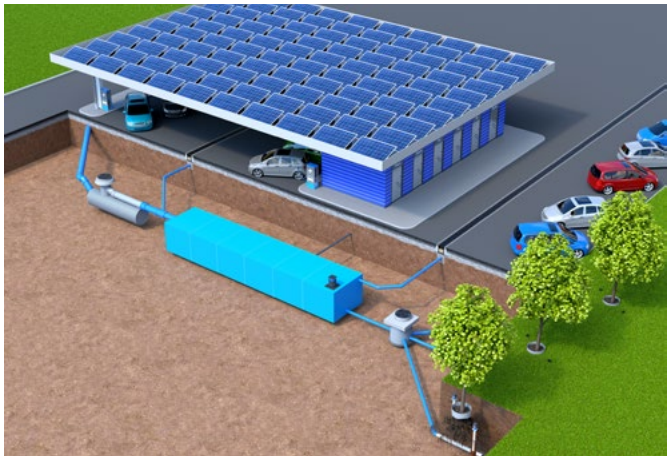
The effect is intensified by the asphalt, which heats up in urban areas during the day and continues to radiate heat at night. This prevents greenery from ever resting. In cities, the phenomenon of "tropical nights", when temperatures do not drop below 20 degrees Celsius, is on the increase. According to the German Federal Environment Agency, urban temperatures in summer can be up to 10 degrees Celsius higher than in the surrounding countryside. All of this makes water shortages more likely. The trees are not only dried out, but also made more susceptible to pests and fungi. Provided water bags on urban trees, watering vehicles and watering sponsorships by committed citizens can only help in the short term to supply the vital greenery on the doorstep with liquid. In future, it will be more important to tackle the problem of water shortages systematically and in the long term and, for example, to take account of the changed climatic conditions at the planting stage.

Solutions for a viable urban green space

Funke Kunststoffe recognised the need for action at an early stage and dedicated a separate product division to the topic of tree protection. It provides a choice of different items that are already good solutions when used individually but can also be combined with each other – for the benefit of urban trees and therefore also for the benefit of residents.

Outfall pipe with frog flap, transfer point to public waterbodies

The use of tree root vents ensures permanent and sufficient deep ventilation of the tree roots. The Funke Irrigation Angle supplies the root area of the tree with water and nutrients in a targeted manner. During the growth phase, the Funke Irrigation Ring ensures optimum watering above the root ball



Direct tree irrigation through stormwater treatment via a sedimentation unit and D-Rainclean® Filtration Channel with storage in a KS-Bluebox®

Deciduous trees evaporate up to

500 l

of water on hot summer days.

The Tree Root Vent and the Irrigation Angle are now in use in many cities throughout Germany and help urban trees to grow healthily by improving the supply of air and water. Funke has designed the Irrigation Ring especially for the growth phase of newly planted trees.

Sponge city principle with Funke solutions

The increasing frequency of heavy rainfall events and periods of drought as a result of climate change make it necessary to rethink stormwater management. Instead of discharging precipitation via the sewer system, the trend is increasingly towards storing stormwater locally and returning it to the natural water cycle. The catchword for this urban planning concept is 'sponge city'.

Collecting precipitation locally relieves the sewer system. The risk of flooding is reduced. At the same time, the local water reservoirs have a positive effect on the microclimate. They supply trees with water and help to cool temperatures through evaporation.

However, not all stormwater is allowed to infiltrate underground without further treatment. Surface water runoff from traffic areas in particular is polluted by tire and brake abrasion, corrosion, exhaust fumes and particulate matter. Heavy metal emissions from road traffic amount to 931.9 tons of copper per year due to

brake pad abrasion, 75.4 tons of lead and 2077.7 tons of zinc (UBA-FB report "Intrusions of copper, zinc and lead into waterbodies and soils - analysis of emission pathways and possible emission reduction measures", 11.2004 - (Germany)).

Experience in treatment and infiltration

For 20 years, the DIBt-approved D-Rainclean® Filtration Channel has proven itself when it comes to the treatment and infiltration of heavily polluted precipitation. The D-Rainclean® Filtration Channel can also be used in combination with the flat KS-Bluebox®. The latter is used to store the treated water, which is then fed to trees via a DN 1000 Control Chamber using HS® pipes. The INNOLET®-G in combination with a kerb gully is another option for pre-treatment of low-polluted areas. The treated water is supplied to the tree area via irrigation pipes. To avoid waterlogging at the tree roots, the system should be connected to the stormwater sewer with an emergency overflow.

Digitisation possible

Digitisation offers an alternative to the throttle chamber in the area of tree protection. The trees are specifically supplied with water when it appears necessary in view of the data obtained – for example, the age of the trees, the weather forecasts, the precipitation data and the values from the moisture sensors in the area of the planting pit.

Protection against road salt

Passive irrigation of tree sites is possible with the BeWa® Irrigation Gully. It is connected to the stormwater sewer and can direct the collected surface water to the tree site. A special design makes it possible to switch between summer and winter operation. The irrigation connection leading to the tree is blocked by repositioning a guide element in winter mode. This allows all surface water to be directed into the sewer in winter and protects the tree from water containing road salt.

Whether it be a deep vent, irrigation angle, irrigation ring or solutions for the treatment, infiltration or retention of stormwater, the examples show that we can do a lot to ensure the vitality and preservation of our urban trees. There are virtually no limits to the combination of products.

A D-Rainclean® Filtration Channel filled with substrate allows purified stormwater to reach the root ball for irrigation in the tree pit

Several tree site in a row can also be watered from a central point

The special design of the BeWa® Irrigation Gully makes it possible to switch between summer and winter operation during irrigation

Evaporation

Funke solutions in practice

Würzburg (Germany)

HS® Slotted Pipes and Funke Tree Root Vent were used when planting Eichhornstrasse in Würzburg to optimise the tree sites. Water can be poured in through openings in the tops of the castings around the trees, which then reaches the roots via the slotted pipes. In combination with the vertically mounted Tree Root Vents, the supply of air to the roots is ensured.

Special feature: Simple local solution for optimising tree sites

Funke systems: Funke Tree Root Pipes, HS® Slotted Pipes

Soest (Germany)

At Thomästraße in Soest, a tree site was equipped with a water reservoir when it was replanted. HS® Slotted Pipes were laid in a ring around the root ball from a KS-Bluebox® installed below the car park. The 1.7 m³ water reservoir is regularly topped up and ensures continuous supply of water to the root area.

Four additional vertically installed Funke Tree Root Vents ensure that the roots are supplied with air. In addition, the Funke Irrigation Ring, which is made from impact-resistant, weatherproof plastic, ensures optimum watering during the growth phase. The water no longer runs away but is directed straight to the root ball.

Special feature: Continuous supply of water to the root area

Funke systems: KS-Bluebox®, HS® Slotted Pipes, Funke Tree Root Vent, Funke Irrigation Ring

Bochum (Germany)

When implementing a modern concept for dealing with stormwater in Bochum's city centre, an infiltration system was installed under the middle of the sloping Hattinger Straße.

The D-Raintank 3000® elements with fleece covering were installed between L-shaped concrete blocks. The space above the infiltration trench was filled with soil and planted. The drainage system created in this way has stages in the direction of flow so that the stormwater can be collected in sections in the infiltration trench. At each stage, the water is cascaded to the next stage in a defined quantity via a control chamber. While the stormwater from the roadways runs into the infiltration trench via slots in the L-shaped paving stones through the soil layer, the front roof areas of the houses on the street drain directly into the D-Raintank 3000® infiltration ditches via downpipes and plastic pipes.

Special feature: **Cascade-shaped trough-trench system**

Funke systems: D-Raintank 3000®, Funke Control Chamber

„Thanks to their practical dimensions, the D-Raintank 3000® Elements can be moved by one person without construction equipment and installed within a very short time."

Felix Ständker, site manager,
Stricker Infrastrukturbau GmbH & Co. KG

Fröndenberg (Germany)

In the new development area "Auf dem Buhrlande", a trough-trench system consisting of D-Raintank 3000 smallboxes was installed to prevent possible flooding. With an overall height of just 0.33 m, an important prerequisite for the use of the system was met, because every centimetre counted in the planning. This is partly because the groundwater level in this area is very high.

Special feature: **Low headroom ideal for high groundwater levels**

Funke system: D-Raintank 3000 smallbox®

Photo: THIS

"We want to help"

Interview ...

... with Matthias Funke (Managing Director), Rudolf Töws (Head of Technology) and Frank Horstmann (Stormwater Management Consultant) at Funke Kunststoffe GmbH, about the challenges facing cities and local authorities as a result of climate change. The interview was conducted by Eugen Schmitz, editor-in-chief of the german trade journal "THIS –Tiefbau. Hochbau. Ingenieurbau. Straßenbau".
(from: THIS 4/2023)

We are facing enormous challenges due to climate change, especially in cities. Is the development towards a 'sponge city' the solution?

Matthias Funke: The term 'sponge city' – just like the terms blue-green infrastructure' or 'water-sensitive urban design' – is initially just a generic term. The goal to be achieved is efficient stormwater management. I understand this to mean that, on the one hand, we must learn to deal with heavy rainfall events, but on the other hand, we must not allow the precious resource of water to drain away or infiltrate untreated and unused.

What does this topic involve?

Rudolf Töws: It involves, for example, green roofs, facade greening, evaporation and trough systems, but also the topic of infiltration. We have to get to a point – and I agree with the previous speaker – where we don't simply drain water away from the surface without thinking. For me, this is one of the most important components of the sponge city principle. We have to ensure that we use stormwater and apply it in a targeted manner.

Frank Horstmann: It involves, for example, green roofs, facade greening, evaporation and trough systems, but also the topic of infiltration. We have to get to a point – and I agree with the previous speaker – where we don't simply drain water away from the

surface without thinking. For me, this is one of the most important components of the sponge city principle. We have to ensure that we use stormwater and apply it in a targeted manner.

In Germany, the average amount of precipitation per year can easily amount to 700 to 1,000 litres of water per square meter. Usually, only a fraction of this is used. All too often, a precious raw material is simply wasted.

Is a change in thinking no taking place?

Matthias Funke: We can allow stormwater to infiltrate underground if there is no space or possibility above ground. We can retain it, store it or make it usable again via chambers and pumping systems. The options range all the way to automatic irrigation using digital control.

What do these solutions look like?

Matthias Funke: We can allow stormwater to infiltrate underground if there is no space or possibility above ground. We can retain it, store it or make it usable again via chambers and pumping systems. The options range all the way to automatic irrigation using digital control.

Frank Horstmann: Very often, we also have the problem that stormwater comes from a traffic area. This surface runoff is usually enriched with pollutants, and it is not permitted to simply discharge this into a waterbody. However, there are enough systems that can be used to clean stormwater to a certain extent. When flowing through a Funke Filtration Chamber, for example, more than ≥ 95 % of the sediment contained in the stormwater – but also dissolved and undissolved pollutants – are retained in the various components of the chamber body. The stormwater draining from the chamber meets the test values of the german Federal Soil Protection and Contaminated Sites Ordinance (BBodSchV) and can infiltrate.

"There are only three terms, when it comes to modern stormwater management: drainage, infiltration and evaporation."

In your opinion, are cities and municipalities comparably well prepared for the challenges posed by climate change?

Matthias Funke: The challenges for municipalities vary depending on their size. Smaller towns in a more rural environment have fewer worries in this respect than large cities such as Berlin, Hamburg, Munich or Cologne, which have to deal with enormous amounts of soil sealing.

Rudolf Töws: In addition, there are different approaches and different requirements from state to state, but also from city to city. Some cities are now employing experts who are responsible for all tasks relating to climate adaptation in particular and whose specialist expertise is incorporated into every new construction project. One of its tasks is to draw up proposals on how best to approach the implementation of the sponge city principle. However, as there is still a widespread lack of rules, regulations and legal requirements on this topic, many regions and municipalities do not yet see any need for action.

As always, it's the people who make the difference.

Rudolf Töws: This experience is confirmed by daily practice. There's simply still too much happening on a voluntary basis. This is why it often depends on the commitment of the people involved. Vision is required to solve the tasks. If this is missing, not much will happen.

Matthias Funke: There are certainly large cities, where solutions are being developed and implemented, that act as role models. In these, for example, multi-lane roads are being downsized in order to create a green strip in the middle - in which trees are planted. Or a former sports field is renaturalised and a trough-trench system is implemented in which stormwater is stored and can thus be used for further treatment or utilisation. Such projects should be specifically highlighted in expert networks. As a rule, these are independent centres of excellence in which experts exchange information on such topics and projects.
Experience has shown that many local authorities refer to this.

Is it possible to integrate such concepts into existing structures across the board?

Rudolf Töws: On the one hand, it concerns the prosperity and well-being of cities if the air can be slightly cooled on hot summer days through evaporation, for instance, via large trees or green facades on high-rise buildings. On the other

hand, it is rather unrealistic for every private household to put large trees in the garden or install a green facade. The effort would probably be too great.

Frank Horstmann: However, trees are multi-talented and can do practically anything. They can absorb water, store it and evaporate it. But if we don't rethink and don't accept that we have to put in the work and effort, then we won't get any closer to a modern, future-oriented approach to stormwater.

Matthias Funke: Where new buildings are being constructed, there is of course a completely different scope for implementing modern stormwater management. In my opinion, the issue could also be tackled when renovating old buildings. Everyone talks about thermal insulation, which is to be upgraded to the highest standard, but everything else – whether it be green roofs, facade greening or water recovery – is barely considered.

Are there still no legal requirements or regulations?

Rudolf Töws: In April 2022, the German Association for Water, Wastewater and Waste (DWA) published the Code of Practice DWA-M 102-4/BWK-M 3-4 "Principles for the management and treatment of stormwater runoff for discharge into surface waterbodies – Part 4: Water balance for stormwater management". The entire A/M 102 worksheet/leaflet series deals with water management issues of waterbody protection with a special focus on precipitation-related urban runoff ("stormwater runoff"). With Part 4, the hydrologic balance in the built-up state can be compared with that of the undeveloped state using a simple calculation method based on the parameters of drainage, infiltration and evaporation, and suitable measures for precipitation water management can then be selected in order to achieve the closest possible approximation.

Matthias Funke: For shopping centres and supermarkets, it is generally assumed, for example, that a green roof is implemented, a photovoltaic system is operated and the water is retained on the property and discharged into trough-trench systems. The combination of trees and infiltration trenches also plays an important role here. A planted tree evaporates much more stormwater than a lawn. Accordingly, if sufficient trees are planted, a certain proportion of the available area can be sealed as a car park and the evaporation balance would still not deteriorate.

"We want to help develop and implement ideas, concepts and solutions."

Rudolf Töws: One practical challenge is that shopping centre operators want to use as many square meters as possible as parking spaces. However, planting as many trees as possible is not the only solution. These in turn provide shade, which could limit the efficiency of a photovoltaic system.

The specialist planners will find solutions, but what about the municipalities? The conversations I have had are often characterised by goodwill rather than know-how.

Frank Horstmann: Prior knowledge can be assessed very differently. In my consultations, I have to deal with various departments and contacts. This could be the civil engineering department, the green spaces department, the environmental department or the urban planning department. And when it comes to specific projects, I usually have to deal with the employees of engineering offices that deal with both civil engineering and technical building equipment. There are also landscape architects.

How do you untie this knot?

Frank Horstmann: It is always most effective to discuss such projects at a large interdisciplinary table. Everyone has their own point of view, and you have to work together to implement such projects satisfactorily for everyone involved.

Rudolf Töws: The fact that there are no one-size-fits-all solutions is exciting in the truest sense of the word. No two projects are the same; different ideas and different approaches are required each time. That is the challenge for the planner, but also for us. That's what makes the task so interesting.

Sounds like there's a big need for consulting services ...

Frank Horstmann: We want to help develop ideas, concepts and solutions. We can supply many high-performance products, but it all starts with the idea, the goal and the task at hand. We want to help specialist planners to develop and implement their ideas. Turning the finished concept into products and delivering them is almost the easier part.

When developing a solution, different points of view often come

Matthias Funke (Managing Director), Frank Horstmann (Stormwater Management Consultant) and Rudolf Töws (Head of Technology) (from left to right). Photo: THIS

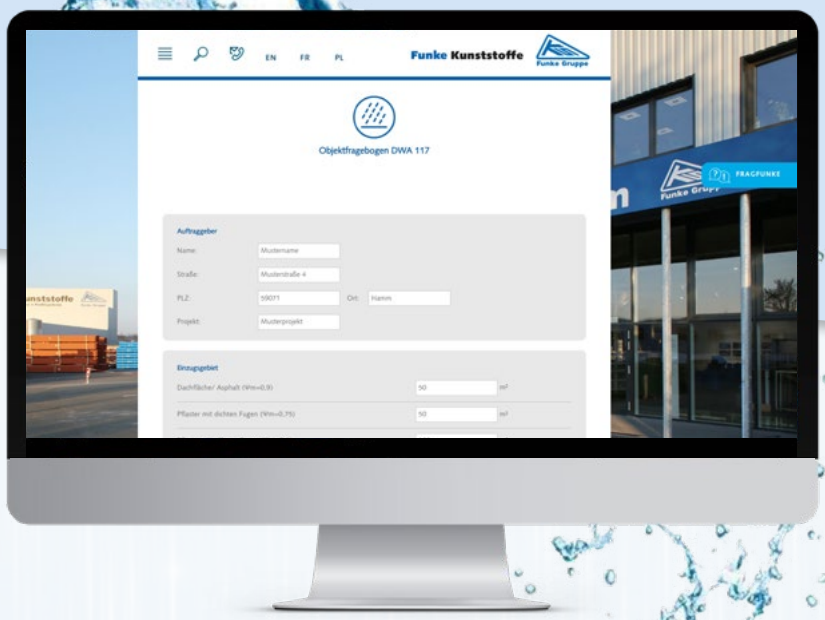
together, such as architects and specialist planners, design and practice. Doesn't that occasionally lead to conflicts?

Matthias Funke: You mention an important aspect. Architects will become even more important in the future, as they are at the beginning of the planning process. And if the draft is not based on a solution-oriented and technically sound foundation, it is difficult or impossible to correct the omissions later on. That's why we need to involve architects much more.

Rudolf Töws: This is one of the reasons why we regularly organise seminars on the various topics, which take place all over Germany. Sometimes around 300 people take part in five events. Usually, only 20 of these are architects, although we specifically approach and invite architectural firms. The is ultimately proof that architects are not yet really familiar with the subject. However, as architects are just as urgently needed as specialist planners to solve and implement the diverse tasks involved in stormwater management in the future, we will be stepping up our commitment in this area even further.

Thank you very much for the interview!

Funke online service



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