Head organisations of German businesses use rainwater as a commodity

The central associations of the German economy, the German Chambers of Industry and Commerce (DIHK), the BDI Association – Voice of German Industry, and the Federal Association of German Employers (BDA), have moved into offices in Muehlendamm in the Berlin-Mitte district. 570 employees work here and the new building was completed in 1999. The office owners took the initiative and invested in rainwater harvesting: their water resources management is exemplary.
Collected rainwater is used throughout the year to flush toilets in the parts of the building that are not open to the public, and also to supply water to the fire sprinkler systems. This article describes experience with rainwater technology gathered by facility management over a period of operation of 15 years.

The planners' concept

The curved glass roof over the large inner courtyard allows water to be drained off into the lower basement of the building via gutters running down the sides of the building and downpipes fitted to the interior. To cope with cold outside temperatures, the gutters on the edge of the glass roof are fitted with heat tracing, which is activated at temperatures lower than 3°C, protecting the drainage system from freezing up. On its way down, the water passes through the filter system in the upper basement, which separates the water from particles of dirt. Fine-meshed sieves with pores of 0.6 mm filter the water coming from the roof, removing the clean rainwater into the storage tank. When rainfall is heavy, excess water is swilled off the filter sieves.

Filter and storage technology in detail

Rainwater is collected from the roof by way of syphonic drainage and fed tangentially through two filters several floors below. Following the patented principle of the vortex filter, the rainwater flows in a broad stream over the cylinder-shaped filter fabric. As a result of adhesive force, it is diverted off sideways through a vertically-positioned fine filter cloth whereupon it falls freely through drainage supports into a special container upstream from the rainwater storage tank. This principle produces an average annual rainwater harvest of over 90%, while any residual water automatically conveys filtered off particles into the River Spree by way of an overflow pipe. This small amount of particles from the roof of the building is not a problem for the River Spree. These substances are harmless, organic elements, composed of bits of plant or moss, or inorganic elements in the form of particles of dust or sand that are blown onto the roof by the wind. In line with the European Union Water Framework Directive and the German Water Resources Act roof surface areas and all the respective particles may be drained into the River Spree.
The filter guarantees safe drainage in accordance with the DIN standard 1986-100:2008-05, "Drainage systems for buildings and properties". There are no cross-sectional constrictions in the device that could cause blockages of dirt and water, which is particularly important in the event of extremely heavy rainfall.

System optimisation

The filter manufacturer has developed and integrated the current directive into both vortex filters. They provide the maximum amount of yield and security. Each one is capable of draining

Figure 1: Haus der Deutschen Wirtschaft, on Muehlendamm, at corner of Berliner Str., Berlin-Mitte/Germany.

Figure 2: Glass roof over inner courtyard as collecting point for rainwater, the wooden facade of the inner courtyard is protected against fire by a facade rainwater sprinkler system.

up to 3,000 m² of roof surface without any build-up being incurred. Because they are integrated on the inside of the building, the size of the filters was doubled; the initial draft by the housing technology engineers originally incorporated 20 smaller individual filters. "In comparison, the time required for maintenance and servicing is now less than 10%," says Norbert Winkler, developer of these products and founder of WISY, Winkler Systeme AG. "The clip included in delivery is used to lift out the filter device. An innovatively attached seal means that inserting and removing the filter device is a simple procedure."
In the course of time, the facility managers have optimised the collection system and its technology at the various points of use.

During regular inspections and services, details worthy of improvement were noted and the following measures were applied:
March 2000: replacement of magnet valve for drinking water supply, as the magnet was too weak and unable to close at a water rate of 10 l/s. This minimises the operating costs in the event that drinking water has to be added occasionally - if there is no more rainwater in the storage tanks - and reduces the risk of water damage in the lower and upper basements.
August 2007: replacement of existing filter device for particles up to a fineness of 0.38 mm with an alternative 0.6 mm device by the manufacturer. This minimises operating costs for cleaning, but contributes to particulate matter in the water storage tank.
August 2008: removal of the save-water button from 8-litre WC flush-cisterns, as the waste water pipes were blocked every 1-2 weeks as a result of the toilets being flushed too economically.
"Even if the demand for water increases, we are able to reduce our operating costs considerably as we do not need to assign external companies so frequently with the job of cleaning out the pipes, which is expensive," explains Thomas Liebe. He is Technical Manager of Gegenbauer Facility Management GmbH in Haus der Deutschen Wirtschaft.

Water balance

Between the beginning of 2006 and the end of 2009 the amount of cistern water required to flush toilets, of 170 m³, increased to 197 m³, partly caused by the temporary removal of the save-water button on the flush units. This is an additional requirement of 16% more water.

The collected rainwater was able to cover 54% of the required amount of 170 m³ in the first 21 months, while 46% was supplied by adding drinking water whenever the tank was empty. In this period, the rainwater tank overflowed only once. This indicates that almost all the harvested rainwater was able to be used (an estimated 98%). The annual yield, calculated from average rainfall over a 30-year period confirms this: at 86 m³ this largely corresponds to the difference in the actually used yield of 91 m³ determined by counter readings.

In the last two months of the period under examination at the end of 2009 the amount of required drinking water determined

Project data

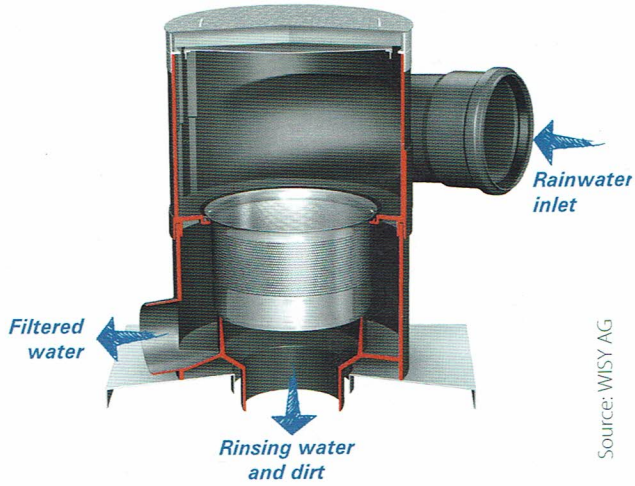
▶ Project address	Breite Straße 29, 10178 Berlin/Germany
Facility Management	Gegenbauer GmbH
Rainwater technology put into operation	year 2000
Employees in building	570
Designated use of rainwater	flush units, water for fire sprinkler system
Annual rainfall Berlin-Mitte 1961-90	574.4 mm
Area for collecting rainwater glass roof, projection	2,000 m²
Rainwater tank, cast-in-place concrete, volume,	280 m³ of which 70 m³ is used for fire extinguishing
Filter housing PP, type	2 x vortex fine filter WFF 300
Filter fabric stainless steel, fineness	0.6 mm
Manufacture and assembly of rainwater filter system	WISY AG, Kefenrod

by the counter fell significantly and the difference of used rainwater of 169 m³ per month accounted for almost double the estimated and statistically possible average monthly value of 86 m³. Accordingly 86% of the 197 m³ was able to be covered by the collected rainwater and only 14% had to be supplemented by drinking water.

The fact that rainfall was double the normal level during 2 months was taken as a possible and probable occurrence. The counter readings happily indicate that even then almost all the harvested rainwater can be used (estimated at 98%). This is, on the one hand, due to the optimal efficacy of the vortex filter and is also a result of the continuous improvements made to the system by Facility Management at the Haus der Deutschen Wirtschaft.

Conclusion

The performance of this 16-year old system, which incorporates a filter and storage tank overflow to the River Spree, corresponds to the directives that have been imposed since the amendment to the German Water Resources Act dated 1/3/2010 and the current DIN standard 1986-100: 2008-05. According to these regulations, rainwater should first and foremost be harvested decentrally, e.g. storage and utilisation or discharge to above-ground watercourses. Here, both happen: 98% of the collected rainwater can be used by this project and 2% is discharged to the above-ground watercourse of the River Spree.



Source: WISY AG

Figure 3: Cross-section of WISY rainwater vortex fine filter WFF 300

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Further information:
www.wisy.eu

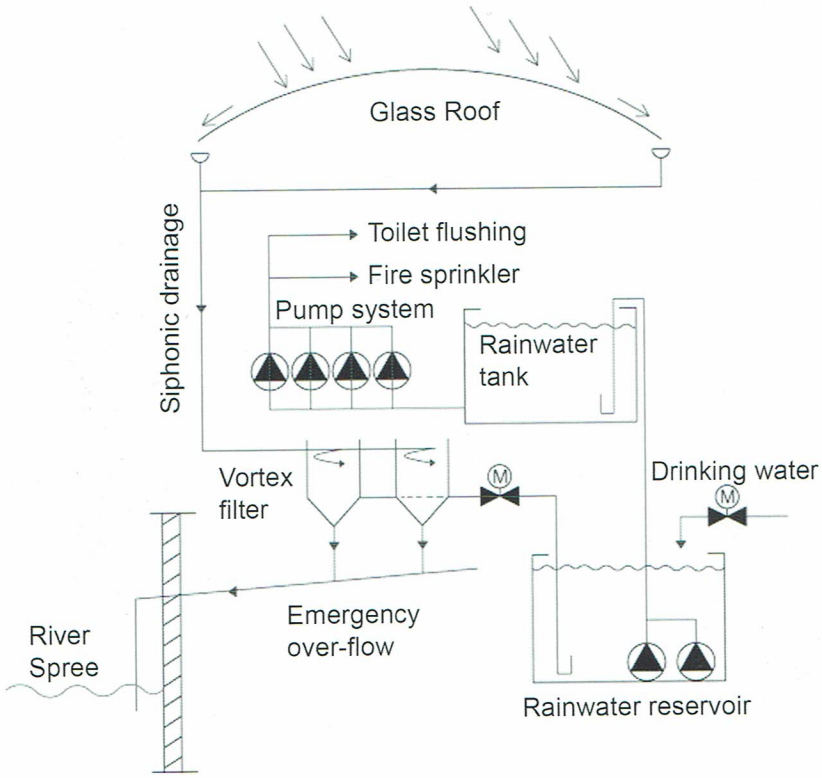

Figure 4: Schematic diagram of rainwater utilisation in Haus der Deutschen Wirtschaft

Source: Klaus W. Koenig

Figure 5: View of building from River Spree. Overflow of rainwater system in bottom right of picture (stainless steel pipe)

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Project data

- WISY AG based in Kefenrod Germany has developed a new pump controller for controlling pumps, pressure booster systems, domestic pressure boosting and rainwater units. This innovative product consumes much less power in standby mode than conventional pump controllers. Its high energy-saving potential also helps to reduce CO2 emissions.
  - Suitable for use with all standard pumps
  - Reduces CO_2 emissions by up to 97%
  - Reduces energy consumption by up to 132 kWh/year
  - Cuts energy costs
  - Electronic control circuit can be retrofitted to all series SA06 pump controllers
  - The pump controller starts the pump automatically to meet water demand
  - German utility model 2020 13011 190.9