KOMS
KOMPETENZZENTRUM SPURENSTOFFE-BW

Removal of micropollutants in the Westerheim wastewater treatment plant

Motive and objective

The Westerheim wastewater treatment plant is situated in the karst area of the Swabian Alb. Since there are no flowing waters in close proximity into which the treated wastewater could be discharged, the wastewater is directly drained into the karst via crevices. Thus, the wastewater reaches the karst groundwater within a relatively short period of time and can be transported across long distances. In order to ensure optimised wastewater treatment, especially also with regard to the importance of the groundwater for drinking water production, the Westerheim municipality decided to construct an additional treatment stage for the elimination of micropollutants. The new process technology is to also reduce the concentration of filterable substances as well as the COD value of the effluent.

Test operation of the new treatment stage started in September 2016.

Process technology used

The Westerheim wastewater treatment plant is the first plant in Baden-Württemberg to permanently use granulated activated carbon to eliminate micropollutants.

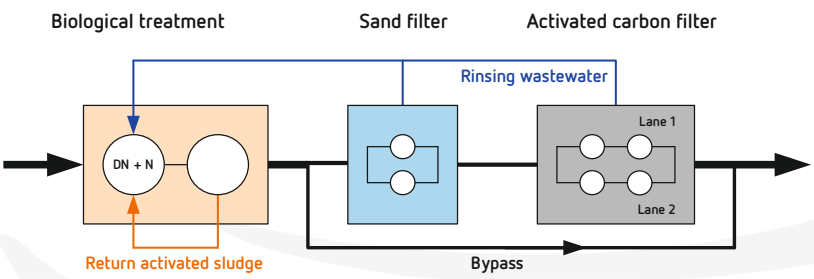

Figure 1 Integration of the activated carbon filter and the upstream sand filter into the current process

Specifications of the wastewater treatment plant

Treatment capacity and load

Treatment capacity	5,500 PE
Load*	4,290 PE

Inflow volumes

Max. in rainy weather	55 L/s
Biologically treated wastewater volume p.a.	Approx. 270,000 m³

Former process technology

Mechanical treatment	Bedload retention system, compact system with screen, grit chamber and grease trap
Biological treatment	One-stage aeration plant with aerobic sludge stabilisation

* Mean value of 2014 to 2016; determined on the basis of the mean COD value measured in the inlet and the annual wastewater volume.

Process technology used

The adsorptive treatment of the wastewater succeeds the biological treatment in an activated carbon filter. In the course of the extension of the plant, an additional sand filter was built, which precedes the activated carbon filter (➔ Figure 1). Both process steps are located in a separate filtration plant (➔ Figure 2).

The sand filter serves to retain the filterable substances exiting the secondary sedimentation tank to the greatest possible extent so that the activated carbon filter is loaded with almost solid-free wastewater, thus reducing the frequency of backflushing. The sand filter is designed as a continuously operated filter consisting of two filtering units.

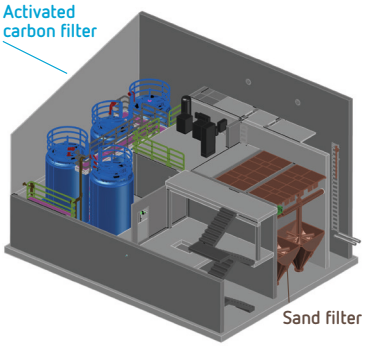

Figure 2 **Constructional design of the filtration plant**
(source: KG – Gesellschaft für Wassertechnik und Apparatebau GmbH & Co. KG)

The activated carbon filter is designed as a two-lane system. Each lane consists of two pressure tanks that are connected in series. Their filter bed is perfused in a downward direction. Water from the effluent of the active carbon filter is used for backflushing.

The sand filter as well as the active carbon filter have been designed for partial flow treatment. Both process stages can be loaded with a maximum wastewater volume of 22 L/s. However, this dimensioning, which is able to process only 40 per cent of the maximum inflow of combined wastewater, allows for the additional treatment of approximately 90 per cent of the total annual wastewater volume in the filtration plant. While both filtering units are operated in parallel in the case of the sand filter, only one lane of the activated carbon filter is loaded if the weather is dry. In this case, however, the lanes are switched after a maximum of two hours to ensure that both lanes are equally loaded throughout the day. If the wastewater volume to be conveyed to the activated carbon filter exceeds 11 L/s, the second lane will we opened. Both lanes are then loaded with the same amount of wastewater until the volume falls below the smallest possible conveyable volume of the pumps. As a result, one lane will be taken out of operation once more.

Dimensioning of the sand filter and the activated carbon filter

Maximum treatable volumetric flow rate	$Q_{max,\ ads.} = 22$ L/s

Sand filter

Number of filtering units	2
Surface area per filtering unit	$A_{filtering\ unit} = 5$ m²
Maximum filtration velocity	$v_{f,\ SF} = 7.9$ m/h

PAC filter

Number of tanks	2 x 2
Surface per tank	$A_{tank} = 5.3$ m²
Volume per tank	$V_{tank} = 20$ m³
Volume of the activated carbon bed per tank	$V_{GAC,\ tank} = 18$ m³
Maximum filtration velocity	$v_{f,\ GAC} = 7.5$ m/h
Minimum Empty Bed Contact Time	EBCT = 55 min

References

Maier, W. & Rieger, A. (2016):
Granulated activated carbon for the removal of micropollutants in the Westerheim wastewater treatment plant. Presentation held at the 7th KomS Technology Forum in Lahr, Germany on 6 October 2017, organised by the DWA Baden-Württemberg regional chapter. Published in the conference proceedings.

Operator contact
Gemeindeverwaltung Westerheim
Kirchenplatz 16, 72589 Westerheim
Mr Hofele (+49 7333-3328)

Author
Kompetenzzentrum Spurenstoffe Baden-Württemberg
www.koms-bw.de

Status 04.2017