KOMPETENZZENTRUM SPURENSTOFFE-BW

Removal of micropollutants in the Öhringen wastewater treatment plant

Motive and objective

The Öhringen wastewater treatment plant, which is operated as a central wastewater treatment plant by the City of Öhringen and the municipalities of Pfedelbach and Zweiflingen, discharges its treated wastewater into the Ohrn river. Depending on the flow situation, the wastewater discharged by the wastewater treatment plant constitutes more than 50 per cent of the water body. In order to sustainably improve the water quality in the Ohrn river, the wastewater treatment plant was extended by a contact filter by 2012.

The adsorption stage, which was put into operation in March 2017, is to primarily reduce the concentration of micropollutants in the Ohrn river and thus further improve the water quality. In addition, the aim is to further reduce the COD value of the effluent to a value below the threshold and thus be exempt from the wastewater levy for this parameter.

Process technology used

In the Öhringen wastewater treatment plant, micropollutants are eliminated using powder activated carbon (PAC).

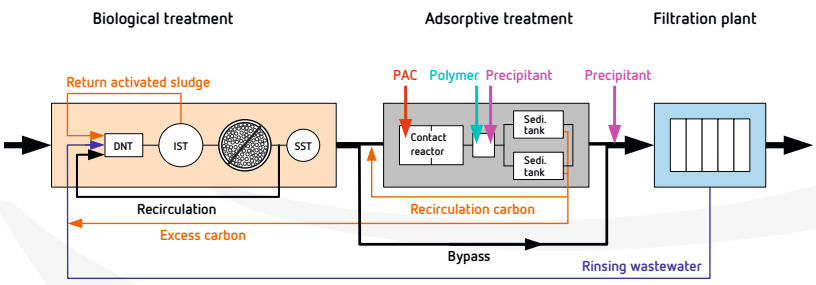

Figure 1 Integration of the adsorption stage into the current process

Specifications of the wastewater treatment plant

Treatment capacity and load

Treatment capacity	49,500 PE
Load*	46,100 PE

Inflow volumes

Max. in rainy weather	500 L/s
Biologically treated wastewater volume p.a.	6 million m³

Former process technology

Mechanical treatment	Screen, grit chamber, grease trap and primary sedimentation tank
Biological treatment	Two-stage system consisting of high-load activated sludge and trickling filters
Filtration plant	Two-layer filter with support layer (0.20 m gravel, 0.40 m sand, approx. 1.00 m hydroanthracite)

* 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

Essentially, adsorptive treatment of the wastewater succeeds the biological treatment and precedes the existing filtration process in an adsorption stage consisting of a contact reactor and two downstream sedimentation tanks, which are operated in parallel (➔ Figure 1). The contact reactor consists of two tanks that are connected in series. In principle, the two tanks can also be operated in parallel. The auxiliary substances (polymer and precipitant), which are required for separating the PAC, are added in a separate distribution system located between the contact reactor and the sedimentation tanks. ➔ Figure 2 shows an aerial photo of the plant.

Figure 2 Aerial photo of the adsorption stage and filtration plant (photo: Rolf Mugele)

For reuse of the adsorbent, the partially loaded PAC is returned to the denitrification tank as excess carbon via the rinsing wastewater line of the sand filter. Alternatively, both volume flows can also be conveyed to the inlet of the primary sedimentation tank.

Being designed as a partial flow treatment, the adsorption stage is able to treat a maximum wastewater volume of 270 L/s. However, this dimensioning, which is able to process approximately 55 per cent of the maximum inflow of combined wastewater, allows for the treatment of approximately 90 per cent of the total annual wastewater volume in the adsorption stage.

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Dimensioning of the adsorption stage

Maximum treatable volumetric flow rate	$Q_{max, ads.} = 270$ L/s

Contact reactor

Number of tanks	2
Volume per tank	$V_{tank} = 260$ m³
Total volume	$V_{CR} = 520$ m³
Minimum retention time for design flow	$t_{RT, CR} = 32$ min

Sedimentation tank

Volume	$V_{sedi.} = 2 \times 960$ m³
Surface area	$A_{sedi.} = 2 \times 229$ m²
Minimum retention time for design flow	$t_{RT, sedi.} = 2.0$ h
Maximum surface load for design flow	$q_{RT, sedi., L} = 2.1$ m/h

References

Geiger, H. (2016):
The Öhrigen approach to the elimination of micropollutants. DIE GEMEINDE – Magazine for Cities and Municipalities, Organ of the association of municipalities in Baden-Württemberg (Gemeindetag), in-house publisher, Stuttgart (139) 11/2016, pp 521–527.

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