KOMPETENZZENTRUM SPURENSTOFFE-BW

Removal of micropollutants in the **Laichingen wastewater treatment plant**

Motive and objective

The Laichingen 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 a retention and a spreading tank. Thus, the wastewater reaches the karst groundwater relatively fast 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, a request has been raised in the course of the renewal process of the discharge licence issued under water law to construct an additional treatment stage for the elimination of micropollutants. At the same time, the new process technology is to significantly reduce the concentration of filterable substances as well as the COD effluent value. Test operation of the new treatment stage commenced in November 2015.

Process technology used

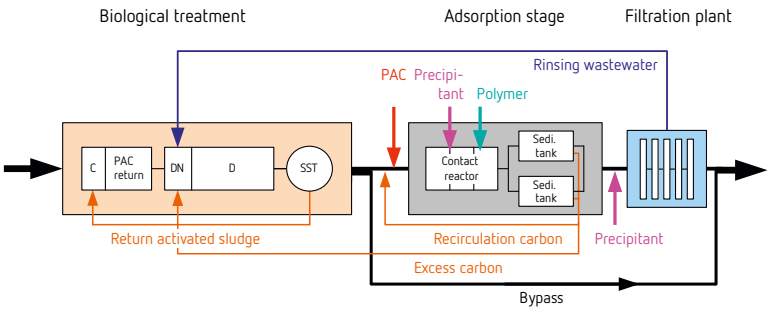

Figure 1: Integration of the adsorption stage and filtration plant into the current process

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

Specifications of the wastewater treatment plant

Treatment capacity and load

Treatment capacity	35,000 PE
Load *	29,600 PE

Inflow volumes

Max. in rainy weather	195 L/s
Biologically treated wastewater volume p.a.	1.2 million m^3

Former process technology

Mechanical treatment	Coarse rack, grit chamber, grease trap, screen
Biological treatment	One-stage aeration plant with aerobic sludge stabilisation

* Mean value of 2012 to 2014; 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 stage and involves a contact reactor, which is designed as a three-stage cascade, and two downstream sedimentation tanks that are operated in parallel (➔ Figure 1). The partially loaded PAC is removed from the adsorption stage by extracting excess carbon, which is then conveyed to the denitrification tank for further utilisation of the adsorption process.

A new filtration plant, which is required for solids separation, has also been installed. The filtration plant is designed as a cloth filter.

Figure 2:
Replaceable container for PAC storage

A special feature of the Laichingen wastewater treatment plant is the way in which PAC stock is stored. The stock is not stored in a silo, as is usually the case, but in replaceable containers with a volume of approximately 2 m^3 each (➔ Figure 2).

The adsorption stage as well as the filtration plant have been designed for partial flow treatment as the regular operation scenario. In the case of the selected dimensioning volume of 100 L/s, approximately 90 per cent of the total annual wastewater volume is directly treated in the adsorption stage and the filtration plant. However, in the light of the hydraulic performance only, it was requested that it should be possible to load the plant with the entire combined wastewater inflow of 195 L/s. Therefore, the sedimentation tanks have been additionally equipped with lamella separators in order to increase the effective surface area.

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Dimensioning of the adsorption stage

Maximum treatable volumetric flow rate	$Q_{max, ads.}$ = 100 L/s

Contact reactor

Number of tanks	3
Volume per tank	V_{tank} = 90 m^3
Total volume	V_{CR} = 270 m^3
Minimum retention time for dimensioning inflow	$t_{R, CR}$ = 45 min

Sedimentation tank

Volume	$V_{Sedi.}$ = 2 x 365 m^3
Actual surface area	$A_{Sedi.}$ = 2 x 87 m^2
Effective surface area	$A_{effective, L}$ = 2 x 173 m^2
Minimum retention time for dimensioning inflow	$t_{R, Sedi.}$ = 2.0 h
Maximum surface load for dimensioning inflow	$q_{R, Sedi.}$ = 1.0 m/h

References

Baur, S. (2014):
Planning of the fourth treatment stage in the Laichingen wastewater treatment plant). Presentation held at the wastewater treatment plant expert forum in Stuttgart, Germany on 27 November 2014, organised by the DWA-Landesverband Baden-Württemberg. Published in the conference proceedings.

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