

Removal of micropollutants in the Langwiese wastewater treatment plant

Motive and objective

The Langwiese wastewater treatment plant discharges its treated wastewater into Lake Constance via the Schussen river. Due to the density of the population and the strong industrial as well as agricultural use of the Schussen basin, the river is among the Lake Constance tributaries with the highest concentration in micropollutants. For reasons of preventive water pollution protection, especially also in view of the importance of Lake Constance for the drinking water supply, the Abwasserzweckverband Mariatal (Mariatal Wastewater Association), which is based in Ravensburg, therefore decided to voluntarily construct an additional treatment stage to eliminate micropollutants. The operation of the new treatment stage started in October 2013.



Process technology used

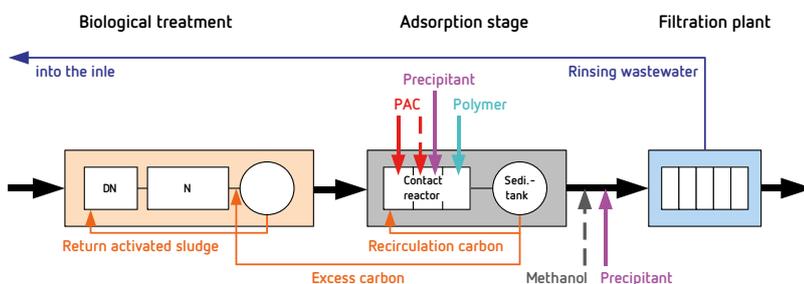


Figure 1 Integration of the adsorption stage and filtration plant into the current process

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

Specifications of the wastewater treatment plant

Treatment capacity and load

Treatment capacity	184,000 PE
Load *	200,300 PE

Inflow volumes

Max. in rainy weather	1,100 L/s
Biologically treated wastewater volume p.a.	16 million m ³

Former process technology

Mechanical treatment	Screen, grit chamber, grease trap and primary sedimentation tank
Biological treatment	One-stage aeration plant
Filtration plant	Two-layer filter (0.70 m quartz sand, 1.00 m anthracite) with denitrification of residuals

* Mean value of 2010 to 2012; 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 a one-lane adsorption stage consisting of a contact reactor, which is designed as a three-stage cascade, and a downstream, circular sedimentation tank (➔ Figure 1). The partially loaded PAC is returned to the biological treatment stage as excess carbon in order to further utilise the adsorbent.

The adsorption stage in the Langwiese wastewater treatment plant is designed for the total flow rate. Thus, the system is currently the largest of its type in Germany with regard to the maximum treatable volumetric flow rate in the adsorption stage.

SchussenAktivplus

The scientific ›SchussenAktivplus‹ project investigates the extent to which the concentration in micropollutants and germs can be reduced in the Schussen tributary by means of taking further measures in wastewater treatment plants and storm water overflows of various sizes. Furthermore, it analyses the specific impact of these measures on aquatic organisms such as fish, invertebrates and plants. The effects of the improved effluent quality in the Langwiese wastewater treatment plant resulting from the operated adsorption stage will continue to be analysed until the end of 2014. The monitoring results regarding the assessment of the water condition prior to the implementation of the new process technology have been summarised in a final report. The report is available for download under the following hyperlink: www.schussenaktivplus.de/de/publikationen.

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Dimensioning of the adsorption stage

Maximum treatable volumetric flow rate	$Q_{\text{max, ads.}} = 1,100 \text{ L/s}$
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Contact reactor

Number of tanks	3
Volume per tank	$V_{\text{tank}} = 1,250 \text{ m}^3$
Total volume	$V_{\text{CR}} = 3,750 \text{ m}^3$
Minimum retention time for dimensioning inflow	$t_{\text{R, CR}} = 57 \text{ min}$

Sedimentation tank

Volume	$V_{\text{sed.}} = 8,500 \text{ m}^3$
Surface area	$A_{\text{sed.}} = 2,040 \text{ m}^2$
Minimum retention time for dimensioning inflow	$t_{\text{R, sedi.}} = 2.1 \text{ h}$
Maximum surface load for dimensioning inflow	$q_{\text{R, sedi.}} = 1.9 \text{ m/h}$

References

Baur, S. (2011):

Installation of the largest PAC adsorption plant with regard to hydraulics in Baden-Württemberg). Presentation held at the 'Elimination of micropollutants in wastewater' seminar in Ulm on 31 March 2011, organised by the Ulm regional chapter of the BWK-Landesverband Baden-Württemberg (National BWK association Baden-Württemberg).

Jedele, K. (2013):

Wastewater and process-related approaches to the elimination of micropollutants in the Lake Constance basin). Presentation held at the DWA -Landesverbandstagung Baden-Württemberg in Friedrichshafen on 18 October 2013. Published in the conference proceedings.