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

Motive and objective

The Lahr wastewater treatment plant discharges treated wastewater into the Schutter bypass channel, which is an artificial water body that is part of a spillway system. The water quality in the bypass channel is significantly influenced by the effluent discharged from the wastewater treatment plant during dry weather. In the context of the renewal of the discharge licence issued under water law, the Abwasserverband Raumschaft Lahr (Lahr Region Wastewater Association) decided to construct an additional adsorptive treatment stage in the wastewater treatment plant as an alternative to laying a multi-kilometre sewer pipe leading to the Rhine River, since the adsorptive treatment would significantly improve the future quality of the wastewater discharged into the Schutter bypass channel. The decision was preceded by pilot tests conducted in 2010 and 2011, which showed that especially the concentration of micropollutants could be extensively reduced by means of this process technology.

Test operation of the new treatment stage commenced at the end of June 2015.

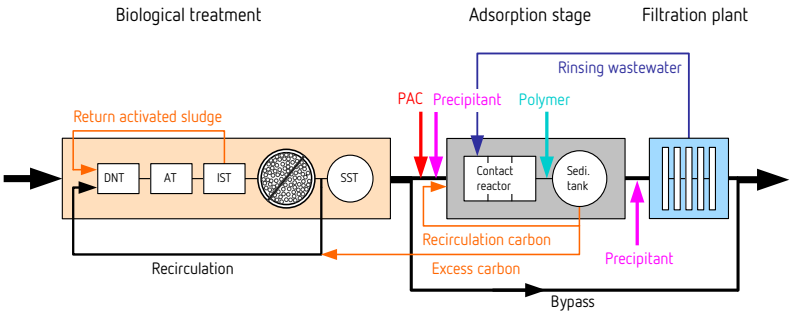

Figure 1: Integration of the adsorption stage and filter plant into the current process

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

Specifications of the sewage treatment plant

Treatment capacity and load

Treatment capacity	100,000 PE
Load *	70,100 PE

Inflow volumes

Max. in rainy weather	650 l/s
Biologically treated wastewater volume p.a	7 million m³

Former process technology

Mechanical treatment	Screen, grit chamber and grease trap
Biological treatment	Two-stage system consisting of high-load activated sludge and trickling filters

* Mean value of 2010 and 2011; 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 a downstream sedimentation tank (➔ Figure 1). The partially loaded PAC is removed from the adsorption stage by withdrawing excess carbon, which is then added to the recirculation pipe of the biological treatment stage for reuse. The carbon ultimately reaches the inlet of the denitrification tank via the recirculation pipe.

A new filter plant, which is required for solids separation, has also been installed. The filter plant is designed as a cloth filter (➔ Figure 2). Thus, the Lahr wastewater treatment plant is the first plant to use a cloth filter instead of a classic two-layer filter after adsorptive treatment. Preliminary pilot tests conducted in the Lahr wastewater treatment plant had already confirmed the general suitability of cloth filtration for the given purpose.

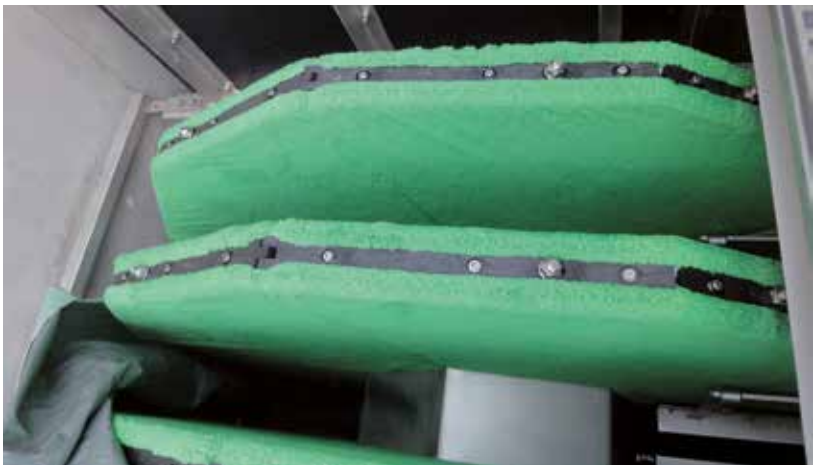

Figure 2: Filter discs of the cloth filter prior to the start of operation

The adsorption stage as well as the filter plant have been designed for partial flow treatment. Both process stages can be loaded with a maximum wastewater volume of 350 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 90 per cent of the total annual wastewater volume in the adsorption stage and the filter plant.

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Dimensioning of the adsorption stage

Maximum treatable wastewater flow	$Q_{max, ads.}$ = 350 l/s

Contact reactor

Number of tanks	3
Volume per tank	V_{basin} = 326 m³
Total volume	V_{CR} = 978 m³
Minimum retention time for design flow	$t_{R, CR}$ = 7 min

Sedimentation tank

Volume	$V_{sedi.}$ = 3,550 m³
Surface area	$A_{sedi.}$ = 900 m²
Minimum retention time for design flow	$t_{R, sedi.}$ = 2.8 h
Maximum surface load for design flow	$q_{R, sedi.}$ = 1.4 m/h

References

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