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

Motive and objective

The Zweckverband Klärwerk Steinhäule (Steinhäule wastewater treatment plant association), which is also responsible for wastewater treatment in the cities of Ulm and Neu-Ulm, for example, has been conducting research on the topic of improved wastewater treatment for as long as ten years. The initial objective of the research conducted in cooperation with the Biberach University of Applied Sciences was to identify a suitable process variant that could permanently reduce the COD concentration in the effluent of the wastewater treatment plant to fall below the 20 mg/L threshold in order to be exempt from the wastewater levy imposed for this parameter. In various research projects, which lasted over several years, the 'adsorption stage' was developed, which not only reduces the dissolved organic residue by means of powder activated carbon (PAC) but also largely eliminates a variety of micropollutants from the wastewater. In February 2015, operation of the adsorption stage, which had been installed on a large scale, was officially started.

Process technology used

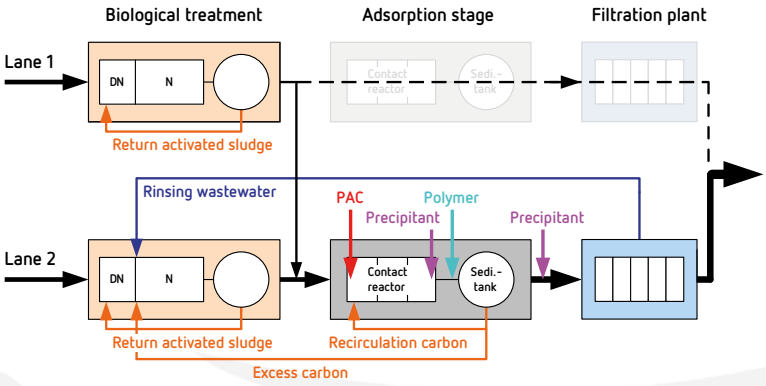

Figure 1: Integration of the adsorption stage into the current process

In the Steinhäule wastewater treatment plant, micropollutants are eliminated using PAC.

Specifications of the wastewater treatment plant

Treatment capacity and load

Treatment capacity	445,000 PE
Load *	347,200 PE

Inflow volumes

Max. in rainy weather	2,600 L/s
Biologically treated wastewater volume p.a	39 millionen m^3

Former process technology

Mechanical treatment	Grit chamber, grease trap, screen, primary sedimentation tank
Biological treatment	One-stage aeration plant

* Mean value of 2010 to 2013; 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 involves a contact reactor, which is designed as a three-stage cascade, and a downstream sedimentation tank (→ Figure 1). A new filtration plant, which is required for solids separation, has also been installed. It is designed as a two-layer filter (75 cm quartz sand, 75 cm hydroanthracite).

The special feature of the Steinhäule wastewater treatment plant, i.e. the two-lane design of all treatment stages, has been maintained as part of the implementation of the new adsorptive process technology. Owing to the option to offset costs against the wastewater levy, the extension is carried out gradually. At present, the part of the plant succeeding the biological treatment in lane 2 is being operated. In order to maximise the wastewater volume treated in the adsorption stage, a varying proportion of the volumetric flow rate of lane 1 is added to the inlet of the adsorption stage where it is treated and subsequently filtered (Q_{max}, ads. = 1,600 L/s). Operation of the second lane is scheduled to start in 2020.
As the process technology renders the addition of a precipitant necessary in the area of the adsorption stage and before the wastewater enters the filtration plant, the aim is to not only reduce the COD concentration to fall below the corresponding threshold, but to likewise reduce the phosphorus concentration to fall below the threshold (P_{total} < 0.1 mg/L) once the wastewater treatment plant has been extended to the capacity required for the treatment of the total flow rate.

Dimensioning of the adsorption stage

Maximum treatable volumetric flow rate	$Q_{max, ads.}$ = 1,600 L/s

Contact reactor

Number of tanks	3
Volume per tank	V_{tanks} = 1,090 m³
Total volume	V_{CR} = 3,270 m³
Minimum retention time for dimensioning inflow	$t_{R, CR}$ = 34 min

Sedimentation tank

Volume	$V_{Sedi.}$ = 11,470 m³
Surface area	$A_{Sedi.}$ = 2,825 m²
Minimum retention time for dimensioning inflow	$t_{A, Sedi.}$ = 2.0 h
Maximum surface load for dimensioning inflow	$q_{R, Sedi.}$ = 2.0 m/h

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Publications and documents

Hiller, G. (2011):
Use of PAC in the Steinhäule wastewater treatment plant). Presentation held at the 44th Essener Tagung in Aachen, Germany from 23 to 25 March 2011, organised by the Gesellschaft zur Förderung der Siedlungswasserwirtschaft an der RWTH Aachen e.V. Published in the conference proceedings.

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