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Granular activated carbon filters in wastewater treatment plants for the elimination of organic micropollutants

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Project example:
Removal of micropollutants in activated carbon filters at the wastewater treatment plant „Obere Lutter“

Customer:
AOL, Abwasserverband „Obere Lutter“ für die Kreise Bielefeld und Gütersloh

funded by:
Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen

Project description:
The adsorption of organic micropollutants and the COD on granulated activated carbon (GAC) as a quaternary treatment step has been studied in the wastewater treatment plant of AOL. For operational tests a filter chamber of the flocculation/ filtration stage was reequipped with granular activated carbon. In parallel a pilot filter was operated. A very good elimination performance and a long runtime (14 months) until a necessary reactivation of the GAC were realized. The results gave rise to convert gradually 5 of the 10 existing floc-filters to adsorbers for routine operation at relatively low operating cost (0.09 EUR/m³). In the runtime tests, engineering aspects for the design and layout of such wastewater treatment units were considered to receive insights into plant operations and costs. In further tests the parallel use of "fresh" GAC versus reactivated GAC was reviewed in terms of their efficiency. Moreover, the “dynamic” feed rate for the adsorber was examined i. e. adapted to the current discharge flow of the sewage treatment plant, and compared to a constant filtration rate. Additionally, a discontinuous operation has been studied in only five days a week for an effluent with a significant industrial impact.

Our services:
- selection of the optimal activated carbon based on adsorption isotherms
- support in retrofitting and commissioning of absorbers
- recommendation of a backwash program
- monitoring of the adsorber bed (structure, layer, grain sizes) during operation
- parallel operation of a small-scale absorber under the influence of changed process parameters
- chemical analysis and evaluation of micropollutants, eco and human tox-tests
- cost calculations (OPEX, CAPEX)
- recommendations for further operation

Specifications of the piloting:

filter area per filter:	40 m²
hydraulic loading rate:	2 - 8 m/h
bed length (activated carbon):	2,5 m
empty bed contact time:	75 – 19 min
bed volume treated:	ca. 14.000 m³/m³

Project period:
two projects in the period 2011 und 2015

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