

Efficient and economic segregation of powdered activated carbon using hydrocyclones after removal of micro-pollutants and organic residues from municipal and industrial wastewater

State of the art for the removal of micropollutants and organic residues at this time is the application of activated carbon, where powdered activated carbon (PAC) is first getting mixed into conventionally treated wastewater and then subsequently removed again in sedimentation basins and flocculation filters after addition of precipitants and flocculation aids. This process has been developed in the 1990's at the ISWA in Stuttgart to remove reactive dyes from wastewater and is described as the AFSF-technique (adsorption-flocculation-sedimentation-filtration). However, disadvantages of this technique are e.g. large floor space requirements and high investment costs for the construction of mixing and settling tanks as well as expensive operational costs such as the usage of precipitants and flocculation aids. Thus, the benefit of the hydrocyclone technology compared to the AFSF-process is the reduced space requirement, lower investment and running costs through reduced operational supplements as well as the modularity, which makes it particularly useful for many industrial applications.

The objective of this interconnected research project has been to develop and practically test an economic and efficient hydrocyclone system for the removal of powdered activated carbon loaded with micropollutants from wastewater. Therefore a pilot plant with a scale of 10-20 m³/h has been planned and provided by the company of Dürr to be installed at the wastewater treatment plant in Baden-Baden – Sinzheim. Besides the energy consumption of the plant, operating parameters such as flow rate, head loss, separation efficiency, dosing amounts, impact of different types of PAC, etc. has been continuously analysed, evaluated and optimized. Furthermore it has been investigated, whether the choice of coarser PAC (> 20 µm) results in a quasi-complete separation. Additionally a fabric pile cloth filter provides by the company Mecana Umwelt GmbH, Switzerland, has been operated as last filter stage after the multi-hydrocyclone. Simultaneously, analysis of selected micropollutants has been conducted in order to compare the adsorption performance of the different sorts of PAC.

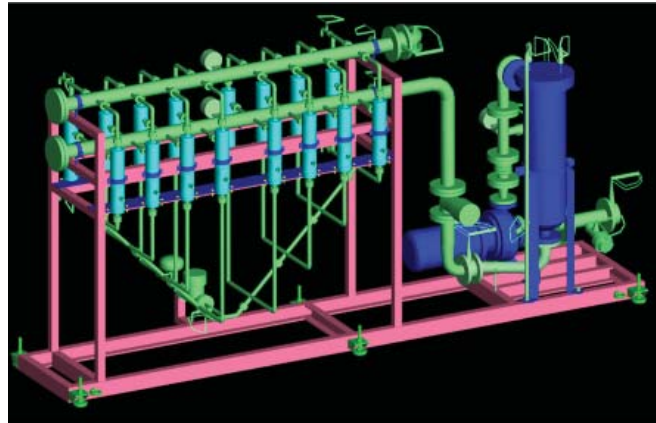


Figure: Construction of the multi-hydro-cyclone pilot plant



Figure: Primary clarification, combined heat and power plant, and biogas plant of the wastewater treatment plant in Baden-Baden

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