

## Deep bed filter as pre-treatment to stormwater

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### ABSTRACT

This paper presents the results of experiments on the application of dual media and single media deep bed filters as pre-treatments to stormwater. In-line flocculation-filtration experiments were conducted with dual and single media filter. The single filter media (80 cm) consisted of either anthracite or sand, and the dual media filter consisted of sand (40 cm at the bottom) and anthracite (40 cm on top). Filtration velocities of 5 m/h, 10 m/h and 15 m/h were examined. The removal efficiency for turbidity, suspended solids and TOC was found to be 95%, 99% and 30–45% respectively at a flocculant dose of  $\text{FeCl}_3$  of 15 mg/L. The anthracite filter media showed a lower headloss development (26 cm, operated at 5 m/h filtration velocity with  $\text{FeCl}_3$  dose of 5 mg/L). The removal efficiency for nitrogen was lower than phosphorus which was relatively good (up to 50%). The removal efficiency for heavy metals such as Cd, Pb, Cr and Ni was found to be very low for all tested filtration systems because concentrations of these metals in the influent were also low. This filter can be used as a pretreatment to a membrane filter as the modified fouling index was reduced from  $750 \text{ s/L}^2$  (for stormwater) to  $15 \text{ s/L}^2$  (for filtered effluent). Detailed submerged membrane filter experiments conducted with pre-treated water showed that the membrane filter can be successfully be used as post-treatment to in-line flocculant-filter at a sustainable flux of  $10 \text{ L/m}^2\cdot\text{h}$  to remove the remaining solids and pathogens. An increase of air scouring in the membrane unit decreased the pressure development although it did not have any effect on increasing the critical flux beyond  $10 \text{ L/m}^2\cdot\text{h}$ .

*Keywords:* Deep bed filter; In-line flocculation; Hollow fibre membrane; MFI

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