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INNOVATION DAY

Innovative solution of fibrous filters for deep-bed filtration

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Water is a strategic material. Recycling it is an important component of balancing its use. Deep-bed filtration is an inexpensive purification method and seems to be very effective in spreading water recovery. Good filter designs, such as the fibrous filter, have high separation efficiency, low resistance for the up-flow-ing fluid and high retention capacity. As it is already known how to perform the computer simulations to obtain the best optimal theoretical structure of the filter for the desired contamination removal, it is difficult to compare the obtained data with the experimental results.

In this study the empirical model describing fibrous filtration is proposed. It is compared with the present knowledge about water depth filtration. A number of tests in the industrial scale were performed under the constant flow conditions on the filters characterized by different morphologies, varying in fiber diameter and fabric structure porosity. The behavior of solid particles as well as bacteria within the porous structure of the fibrous filter is described, regarding the resuspension phenomena.

The obtained data determine the direction of the novel filter design. It seems impossible to separate biotic contamination with high efficiency and reasonably low pressure drop by the usage of these filters, however the surface modifications could prevent biofouling of the filter and therefore greatly increase the filter longetivity. Solid particles removal should include mostly the local porosity changes, changes of the shear stress conditions, that lead to the resuspension of the deposit inside of the filter fabric or even to the filtrate. If all these assumptions will be fulfilled, the filtration process will be less expensive and people will recover water more frequently.