



Introduction

Submerged microfiltration is usually employed with the aid of coagulation of the feed water and air scrubbing of the membranes. High concentrations of suspended solids are reached in the tank where the submerged membranes are positioned. Because of this high concentration of foulants near the membrane surface, the membrane needs frequent cleaning which is usually done by continuous air scrubbing.

Importance

The continuous air scrubbing costs a lot of energy and is not necessary if the coagulation is optimized to build up a permeable layer of flocs on the membrane surface. In this research we aimed to optimize the build up of a permeable cake layer by changing the coagulation conditions. The run time before a backwash or air scrubbing to clean the membrane is made as long as possible. This new process will not only save energy, but also increase the recovery.

Approach

Surface water from the Schie canal in Delft was used as feed water. The pH was adjusted to the desired values, and after inline coagulation with FeCl_3 the feed water reached the tank with the submerged microfiltration (MF) membranes. The turbidity, dissolved organic carbon (DOC) content, UV extinction, zeta-potential and particle size distribution of the flocs created by the inline coagulation were measured as well to determine the coagulation performance. The trans membrane pressure (TMP) increase was measured during 24 hrs filtration runs, without backwash or air scrubbing.

Result

- Ceramic MF filtration run time can reach 24 hours with a good performance in the submerged coagulation condition, without backwash and air scrubbing.
- The restabilization coagulation zone and the sweep coagulation zone show better membrane filtration performance, compared to the adsorption destabilization coagulation zone.
- The DOC content and zeta potential of the coagulation pretreated water was correlation with membrane filtration performance.
- In the first 3 hours, all operation conditions (coagulant dose 8-16 mg/L Fe, pH 4, 6, 8) show a similar and good membrane filtration performance with only a small increase in TMP due to cake layer build up.

Concluding; coagulation with 16 mg/L iron at pH 4 shows the lowest TMP increase and thus the best results and can decrease the air scrubbing and cleaning frequency to once per day.

More information

D2.3.2.8, in preparation.

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