Sub-department of Environmental Technology

Enhancing biological stability of drinking water by membrane treatment

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Motivation

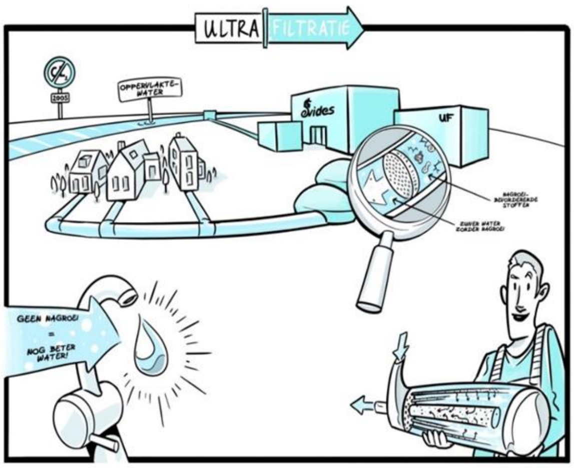
Distribution of potable water without any residual disinfectant eliminates DBP (disinfectant-byproduct formation) and maximizes consumer satisfaction in terms of taste and odor. However, biological stability, i.e. unobjectionable levels of microbial and invertebrate organisms, is to be maintained in the distribution network. Hereto, the drinking water treatment is to achieve production of potable water characterized by a low microbial growth potential (MGP), i.e., low in nutrients (e.g. organic compounds of natural origin) and other growth-promotors (e.g. biomass, particulate matter). Ultrafiltration and capillary nanofiltration membrane treatment have potential in addressing this challenge in surface water treatment. This constitutes a novel application of these existing technologies.

Technological challenge

Ultrafiltration rejects by size-exclusion particulate matter, microbial biomass and, depending on the selected molecular-weight cut-off (MWCO), biopolymeric organic carbon. Therefore, ultrafiltration as posttreatment to existing conventional surface water treatment plants potentially reduces associated MGP. Tighter capillary nanofiltration is to achieve a further reduction in lower Mw organic compounds. However, their impact on biological stability has not been studied extensively yet. Furthermore, although several analytical methods are available to determine waterborne MGP (e.g. Assimilable Organic Carbon, Biomass Production Potential), further extension is desired, whereas it is not yet established with certainty which compounds contribute to MGP.

The behavior of several membrane systems is studied on laboratory, pilot and practice scale. The first results indicate that ultrafiltration posttreatment is capable of significantly enhancing biological stability, and matter of relatively large dimensions is a major factor in MGP. Operational settings and membrane fouling conditions were found to have only marginal impact.

The technological challenge is to (continue to) establish the impact of membrane treatment processes of several MWCO on biological stability, derive in more detail which components govern MGP, and compare and improve analytical methods to quantify MGP predictively in grab samples as well as in practice conditions.



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