



Study on surface water treatment by hybrid sand filtration and nanofiltration

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ABSTRACT

With the promulgation of more stringent regulations to guarantee that the drinking water presents minimal health risks, nanofiltration (NF) process, which has potential for removing organic and inorganic pollutants, is nowadays considered to be the most promising technique and widely used on surface water treatment for drinking water. To evaluate the treatment efficiency of surface water by NF process with hybrid sand filtration (SF) pretreatment, a series of laboratory-scale experiments were carried out at different pressures. Effects of the NF process with the application of SF pretreatment were discussed, and its performances were compared with them of NF process without SF pretreatment. The results showed that higher permeate fluxes were observed in NF process with pretreatment than that without pretreatment. At the pressure of 0.5 MPa, stable flux of the former process after 180 min operation was 47.89 L/m² h, whereas that of the latter was 39.36 L/m² h. NF process had a good removal efficiency on organic pollutants. The removal efficiency of dissolved organic carbon (DOC) was above 80%, reduced from 3.43–4.87 mg/L to 0.52–1.12 mg/L and that of UV254 was above 85% at most of the operation time. The removal rate of conductivity by NF process is higher than that under NF+SF process. With the three-dimensional fluorescence excitation–emission matrices analysis, the NF membrane is very effective for the removal of aromatic proteins, fulvic acid-like materials and humic acid-like organics. The SF pretreatment improved the quality of NF membrane inflow and weakened the membrane fouling, despite almost no increase in removal of DOC, which combination process was efficient to surface water treatment for drinking.

Keywords: Nanofiltration; Permeate flux; Fouling; Pretreatment; Surface water

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