

Gravity-Driven Membrane (GDM) Filtration for Seawater Pretreatment

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Biofouling in RO systems

Biofouling is the most prevalent and troublesome form of RO fouling.
Biofouling is generally caused by bacteria deposition and nutrient supply.

Consequences

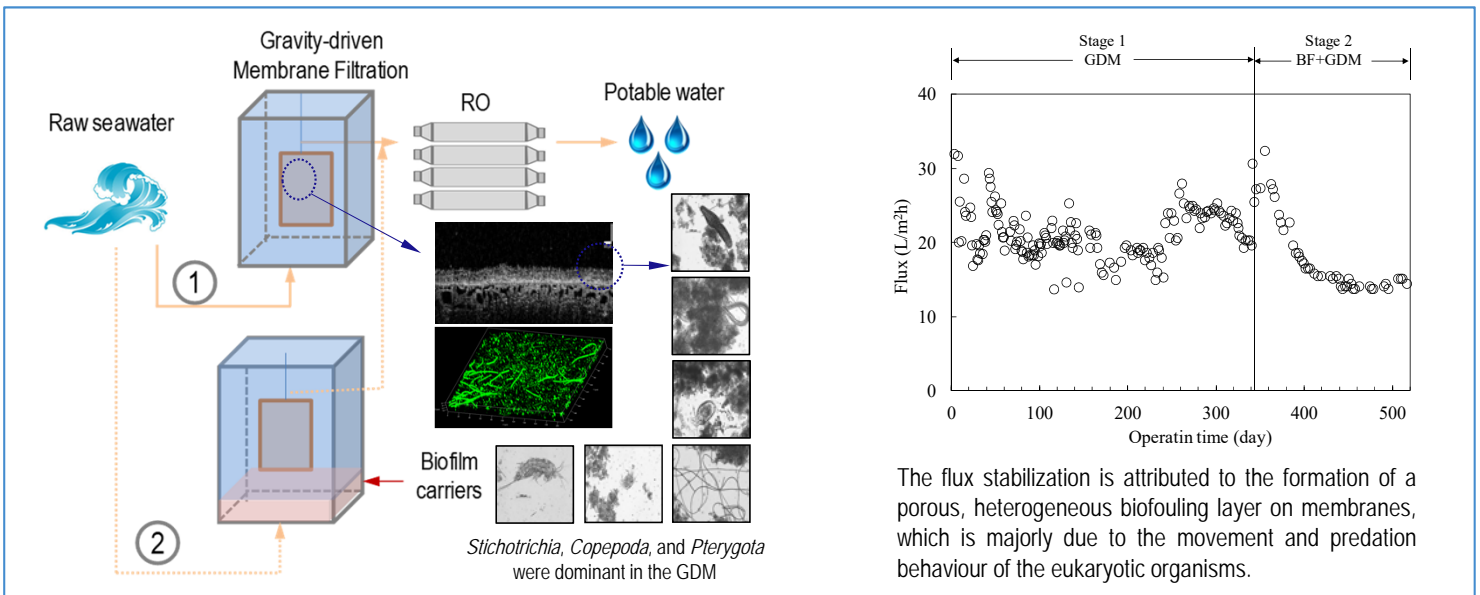
Lower product quality.
Higher pressure drop.
More energy and maintenance costs.

Seawater pretreatment

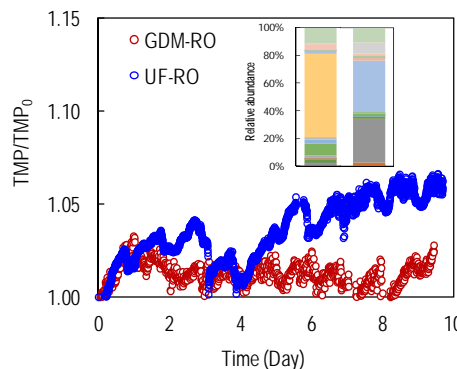
Seawater pretreatment aims to remove particles and reduce organics before RO desalination. However, the energy demand of pretreatment accounts for the majority of the total energy used for intake, pretreatment, post-treatment, and brine discharge stages.

Objectives

To develop **low energy** and **chemical-free** processes for pretreatment of seawater for RO processes.



Parameter	GDM permeate	UF permeate
TEP (mg Gum Xanthan/L)	1.89±1.56	0.63±0.25
Bacterial count (10 ⁴ Cell/mL)	0.28±0.16	0.31±0.26
DOC (mg/L)	1.29±0.33	1.21±0.13
Biopolymers (µg/L)	47 ±15	79±23
Humics (µg/L)	504±39	574±52
Building blocks (µg/L)	186±28	203±14
LMW neutrals (µg/L)	509±283	347±57
LMW acids (µg/L)	1±4	2±4
AOC (µg/L)	68±2	206±138



- ❑ GDM pretreatment led to lower RO fouling than conventional UF system.
- ❑ GDM filtration produced a permeate with less amounts of AOC and biopolymers.
- ❑ Pretreatment approaches affected dominant bacterial species on RO membranes.

References: (1) Akhondi et al. Water Res. (2015) 70: 158-173; (2) Wu et al. Water Res. (2016) 93: 133-140; (3) Wu et al. Water Res. (2017) 114: 59-68; (4) Wu et al. Desalination (2017) 418: 1-8

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