MEMBRANE PROCESSES:
ADVANCEMENTS FOR DRINKING WATER TREATMENT

ROBERT C. ANDREWS, UNIVERSITY OF TORONTO

Published May 2015

KEY MESSAGES FOR DECISION MAKERS

- Many new and upgraded drinking water treatment facilities use membrane processes. This work focused on optimizing membrane efficiency.
- Pre-treatment to minimize membrane fouling is recommended. A very low dose of coagulant (< 1 mg/L) prior to membrane filtration can potentially result in significant cost and energy savings.
- Higher pressure membranes or the addition of adsorbents may be required to remove pharmaceuticals. These advanced processes may not be cost-effective if risk associated with emerging contaminants is low.
- Pharmaceutical compounds were generally not detected in the source waters examined.

WHO IS THIS INFORMATION RELEVANT FOR?

- Municipalities
- Drinking water treatment plant managers
- Drinking water treatment operators and process engineers

WHAT WAS THE RESEARCH FOCUS?

A drawback to membrane processes for drinking water treatment is fouling, where organic matter accumulates on the membrane surface, thereby increasing energy use and operating costs. Membranes are also generally incapable of removing very small-sized contaminants from water, such as pharmaceutical compounds at trace concentrations. This work addressed the challenge of improving the efficiency of membrane processes for drinking water treatment while achieving multiple treated water quality objectives.

WHAT WAS THE RESEARCH METHOD?

- Target specific membrane foulants
- Investigate complementary processes:
  - Examine membrane fouling reduction and pharmaceutical removal in combination with other established treatment processes like coagulation and adsorption.

WHAT WERE THE RESEARCH RESULTS?

Large-sized organics are responsible for fouling membranes. A very low dose of coagulant (< 1 mg/L) prior to membrane filtration can significantly reduce fouling for the water examined.

Rejection of pharmaceuticals by membranes is variable and may be improved with higher pressure membranes and the addition of adsorbents.

WHAT ARE THE IMPLICATIONS FOR DECISION MAKERS?

- Large-sized organic matter from surface waters is primarily responsible for fouling membranes.
- Pre-treatment with a low dose of coagulant (prior to membrane use) is recommended to minimize fouling.
- Significant cost and energy savings may result from reduced coagulant usage, reduced residual waste and improved membrane performance.
- Advanced treatment processes such as higher pressure membranes and adsorbents would be required to achieve significant removal of pharmaceuticals from surface waters during membrane processes.
- This study found that very few pharmaceuticals were present in the surface waters examined, and all at very low concentrations.

MORE INFORMATION IS AVAILABLE AT
WWW.CIVIL.ENGINEERING.UTORONTO.CA/RESEARCH/ENVIRONMENT/DWRG.HTM

Canadian Water Network