DWRG
DRINKING WATER RESEARCH GROUP

Working together for innovation in drinking water quality, treatment, and distribution

Micropollutant Removal in Wastewater Effluents Using Advanced Oxidation Processes

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Centre for Control of Emerging Contaminants (CCEC)

Figure 1: Liquid chromatography-mass spectrometry (LC-MS) at University of Toronto Drinking Water Research Lab used for detection and identification of chemicals in water samples

Figure 2: UV reactor
(source: www.awwa.org)

Figure 3: Collimated UV lamp
(source: www.calgoncarbon.com)

Municipal wastewater is a major source of pharmaceuticals, personal care products (PPCPs) and other endocrine disrupting compounds (EDCs). These chemicals are known to cause significant harm to aquatic organisms and ecosystems. Preventing the release of these compounds to the environment requires changes to how we treat our wastewater.

Advanced oxidation processes (AOPs) such as UV/H_2O_2 can effectively destroy these pollutants, but are expensive and energy intensive. Efficiency is particularly reduced when dissolved organic matter is present, which scavenges the hydroxyl radicals that are the main oxidants in the AOPs. If we can optimize conventional wastewater treatment to improve the removal of organic matter, tertiary treatment using AOPs may be more effective for pollutant degradation, cost-competitive, and energy efficient.

This study identifies treatment options that can increase organic removal during tertiary treatment with AOPs in conventional activated sludge and membrane bioreactors (MBR) treatment systems. Topics being explored include:

(1) Determining whether membrane bioreactors produce an effluent quality that is more amenable to AOP treatment, than conventional activated sludge treatmens; thus providing the most cost-effective treatment strategy when the control of these micropollutants is targeted;

(2) Evaluating the ability of conventional secondary clarifiers to provide better organic matter removal, through the use of enhanced coagulation, powdered activated carbon adsorption, and ion exchange using MIEX, such that subsequent AOP treatment is more efficient.

Through this research, municipalities will be provided with practical options to reduce the concentration of EDCs and PPCPs in the natural environment and reverse the negative environmental impacts.

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