Ozone Pretreatment in High Pressure Membranes

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INTRODUCTION

Potable water reuse is becoming an important component of water resource management. The current approach uses microfiltration (MF) followed by nanofiltration or reverse osmosis. Several utilities have included pre-ozonation to reduce fouling of membrane components.

Oxidation with ozone has shown promise in transforming organic compounds in water. However, ozone may breakdown organic compounds to the extent that limits the effectiveness of membrane filtration. Because there is trepidation regarding the removal of organic compounds during potable reuse, the purpose of this study was to evaluate the impact of pre-ozonation on finished water quality.

OBJECTIVES AND METHODS

How effective is ozone as a pretreatment technique for high pressure membrane systems?

Methods:

- Examining the impact of ozone pretreatment on the fouling potential of high pressure membrane systems.
- Introducing an ozone retention system into a pilot scale treatment train with biologically active filtration followed by granular activated carbon to meet potable water quality standard.

NANOFILTRATION RESULTS

Preliminary nanofiltration testing shows a significant transformation of organic compounds after the introduction of ozone as a pre-filtration disinfectant.

The impact of ozone dosage on the membrane bioreactor effluent was not significant as small and large dosages produced similar water quality.

Total organic carbon and UV$_{254}$ absorbance had a sharp decline after ozonation while decreasing at a lower degree through nanofiltration.

Membrane permeability remained relatively constant throughout the six-eight hour experiments with minimal fouling observed.

NANOFILTRATION RESULTS CONT.

This is an SEM Image of a Nanofiltration membrane (NF270) demonstrating the middle active layer and surrounding support layers where one could expect to see a build up of organic foulants.

FUTURE WORK

1. Examining the impact of ozone pretreatment on the fouling potential of high pressure membrane systems.
2. Introducing an ozone retention system into a pilot scale treatment train with biologically active filtration followed by granular activated carbon to meet potable water quality standard.

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