MICo® - MIEX® Co-Removal Process: DOC and Hardness Reduction

Introduction

Many drinking water utilities are challenged with a raw water source that contains multiple contaminants requiring removal in order to deliver compliant, safe, and aesthetically pleasing drinking water to their customers. The occurrence of dissolved organic carbon (DOC), hydrogen sulfide, bromide, and calcium and magnesium hardness is common in many drinking waters sources in North America, including the Floridan Aquifer, which was the water utilized for the testing conducted in this study.

Utilities faced with several raw water contaminants of concern typically must combine several treatment processes to meet water quality objectives; with one process, such as lime softening, aimed at removing hardness and a second process, such as granular activated carbon (GAC), applied for DOC reduction and disinfection by-product (DBP) control. Even with the application of multiple processes, bromide is likely to pass through the treatment plant, becoming problematic during chlorination. The implemen-tation of a single treatment process to achieve multiple removal objectives can result in a smaller plant footprint, lower operating costs, decreased inventory of spare parts and chemicals, lower waste volumes and greater ease of plant operation.

Process Description

The MICo® process is an advanced ion exchange treatment process that is able to achieve DOC and hardness removal in a single treatment step. A blend of anionic MIEX® Resin and cation exchange resin is applied in a fluidized bed contactor vessel, which simultaneously enables the MIEX® Resin to remove DOC and other anions from the raw water source while the cation exchange resin removes

hardness. The contactor operates continuously. On a periodic basis, a portion of the resin is removed and regenerated, after which it is returned to the contactor vessel. A single regenerant, typically sodium chloride, is used to simultaneously regenerate both the anion and cation resins.

Figure 1: MIEX® Resin Regeneration System

Water Quality Results

Results generated by a pilot scale evaluation of the MICo® process demonstrate reductions in DOC, hardness, bromide, and sulfide as indicated in the following table.

Parameter	Average Raw Influent	Average MICo® Effluent
DOC (mg/L)	6.71	1.51
UV254 Absorbance (cm^{-1})	0.118	0.025
Color (CU)	14	1.5
Total Hardness (mg/L as CaCO$_3$)	255.4	178.8
Calcium Hardness (mg/L as CaCO$_3$)	226.0	148.73
Bromide (mg/L)	0.400	0.3301
Sulfide (mg/L)	1.689	0.0122

1. Several wells were tested; a typical bromide value is presented for one of the wells

2. Water was aerated prior to the MICo® Process
3. Pilot treatment target, additional softening may be possible

Process Benefits

The MICo® process enables utilities to treat multiple contaminants using a single treatment step, therefore achieving treatment objectives for hardness, DOC, and DBPs in a small process footprint with low operating costs. The fluidized bed contactor is tolerant of suspended solids, which allows the MIEX® Co-Removal process to be applied as pretreatment for groundwater or surface water systems. The MICo® process can also be used in the presence of preoxidants. Downstream treatment benefits can include:

• Lower coagulant demand
• Reduced requirements for associated pH adjustment chemicals
• Decreased chlorine demand
• Improved filter performance
• Elimination of a separate treatment system for sulfide removal or hardness removal

The MICo® Co-Removal process provides consistent treatment with low energy consumption and low residuals production so utilities can optimize the use of limited water supplies and natural resources. Additionally, Ixom Watercare is a 2-Time Winner of the AWWA Green Award for providing sustainable water treatment solutions.

Contact Ixom Watercare or your local representative to learn how your utility can benefit from the MICo® process.

Figure 2 - MIEX® Trailer Mounted Pilot System

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MIEX®

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