

# MICo™ Softening Process: DOC and Hardness Reduction in a Single Treatment Process

## MICo™

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 and Biscayne Aquifers. 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 implementation 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.

### MICo Process Discription

The MICo™ process is an advanced ion exchange treatment process that is able to combine multiple medias in a fluidized reactor vessel to remove various contaminants at the same time; MICo™ Softening, for example, can achieve DOC and hardness removal in a single treatment step. A proprietary blend of cationic and anionic MIEX® resin (MIEX® Plus) is applied in a fluidized bed contactor vessel, which simultaneously enables the MIEX® Plus Resin to remove DOC and other anions from the raw water source while also reducing hardness. The contactor operates continuously. On a periodic basis, a portion of the MIEX® Plus 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 anionic and cationic sites found in the MIEX® Plus resin blend.

### Water Quality Results

Results generated by pilot scale evaluations of the MICo™ Softening process demonstrate reductions in DOC, hardness,

bromide, and sulfide as indicated in the table below.

Representative of a Florida groundwater

Parameter	Average Raw Influent	Average MiCoEffluent
DOC (mg/L)	13	3
UV254 Absorbance (cm <sup>-1</sup> )	.465	.133
Color (CU)	59	5
Total Hardness (mg/L as CaCO <sub>3</sub> )	300	110
Calcium Hardness (mg/L as CaCO <sub>3</sub> )	270	80
Bromide (mg/L)	400	330 <sup>1</sup>
Sulfide (mg/L)	1689	11.8 <sup>2</sup>

<sup>1</sup> Several wells were tested; a typical bromide value is presented for one of the wells

<sup>2</sup> Water was aerated prior to the MIEX® Process

### MICo™ Process Benefits

The MICo™ process enables utilities to treat multiple contaminants using a single treatment step, for example the MICo™ Softening process reduces 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 MICo™ process to be applied as pretreatment for groundwater or surface water systems. The MICo™ process can also be used in the presence of pre-oxidants. 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
- Less expensive to operate (with far less residuals and improved DOC removal) than conventional lime softening
- Far less expensive to operate than membrane softening

The MICo™ 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, Orica Watercare is a 2-Time winner of the AWWA Green Award for providing sustainable water treatment solutions.



MIEX® DOC Resin is certified by the NSF for use in drinking water systems under the provisions of the ANS/NSF Standard 61: Drinking Water Components - Health Effects.