

Dissolved Organic Carbon Removal for DBP Reduction & Improved Process Performance



Dissolved Organic Carbon (DOC) Removal

Cost-effective management of dissolved organic carbon (DOC) in potable water is one of the key challenges facing today's water treatment industry. DOC has a major impact on treated water quality and process efficiencies by:

- Reacting with disinfectants to form harmful disinfection by-products (DBPs)
- Influencing the appearance and color as well as the taste and odor of water
- Acting as a food source for micro-organisms, resulting in bacterial regrowth in distribution systems
- Interfering with the performance of activated carbon by competing with targeted compounds for active sites
- Reacting with coagulants causing slower, less effective flocculation and increasing coagulant demand
- Reacting with disinfectants, thus increasing chemical demand
- Reducing the capacity of membrane filtration by fouling

Traditional solutions for the removal of DOC involved the application of complex water treatment processes, requiring large capital outlays and significant increases in operating costs. Ixom Watercare's MIEX® Process offers water treatment operators a cost-effective and environmentally friendly DOC removal process, capable of achieving new standards in water quality. This advanced ion exchange process uses MIEX® Resin to remove target contaminants from water and wastewater streams.

The MIEX® Treatment Process

The name MIEX® comes from 'Magnetic Ion Exchange'. MIEX® Resin beads have a magnetic property that allows them to agglomerate and settle rapidly, or fluidize at high hydraulic loading rates. Because of this unique feature, MIEX® Resin is used in a continuous process with ion exchange occurring in either a mixed tank or a fluidized bed reactor vessel.

The resin beads used in the process are manufactured to be much smaller than conventional ion exchange resins providing 4-5 times the surface area, allowing for rapid exchange kinetics.

DOC Removal Chemistry

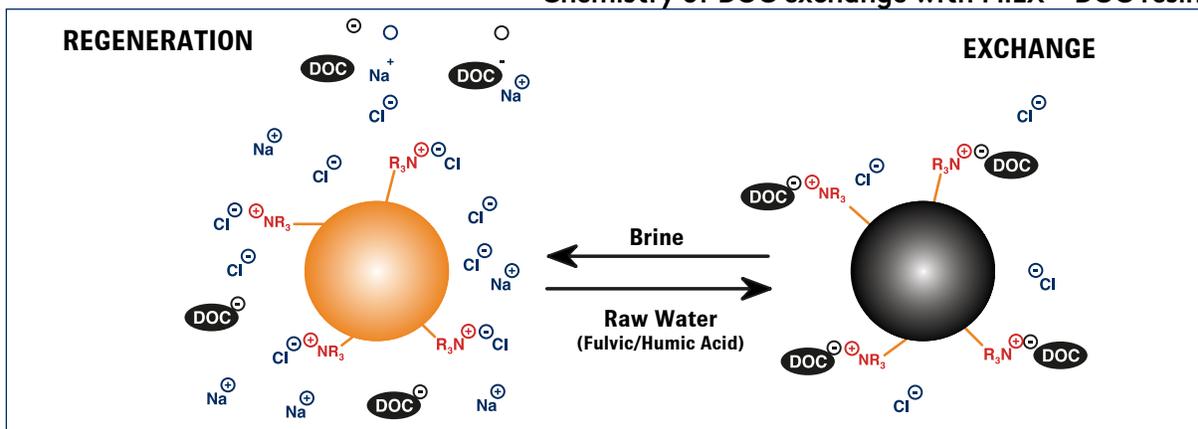
When the resin comes in contact with water, negatively charged organic acids (i.e. DOC) are removed from the water by exchanging with a chloride ion on active sites on the resin surface.

In the regeneration process, resin loaded with DOC undergoes a reversed ion exchange reaction, where chloride ions are substituted for DOC, which is released from the resin into a concentrated brine (NaCl) solution. Other regenerants can also be used.

MIEX® Treatment Systems

MIEX® Treatment Systems are available as packaged systems up to 2 MGD (MAGNAPAK™ Systems) and as custom-designed systems for all capacities over 2 MGD.

Chemistry of DOC exchange with MIEX® DOC resin



Ixom Watercare Inc.
North American Office

Toll Free: 1-877-414-miex

8150 S. Akron St.
 Suite 401
 Centennial, CO 80112

E: miex@ixom.com
www.ixomwatercare.com

MIEX[®] Resin can remove significantly more DOC than coagulation. The graph (Figure 1) below illustrates the DOC removal performance for full-scale MIEX[®] Systems on a range of different water sources. MIEX[®] DOC Resin is particularly effective at removing the low molecular weight fraction of DOC that cannot be removed by enhanced coagulation.

Where MIEX[®] Treatment has been installed as pre-treatment to conventional sedimentation/filtration plants, treated water DOC levels are significantly reduced compared to using coagulation alone. This results in treated water with a lower DOC level and disinfection by-product formation potential as well as a lower downstream coagulant demand.

MIEX[®] Resin preferentially removes the fraction of DOC that results in the formation of DBPs. Pre-treatment with the MIEX[®] Resin therefore allows water systems to meet tightening DBP Standards while continuing with free chlorine disinfection (Figure 2).

The MIEX[®] Process Delivers:

- Consistent treatment that is not subject to chromatographic peaking
- Lower waste volumes than alternative technologies
- Flexibility of placement in the treatment train
- Reliable treatment independent of raw water turbidity
- Elimination or reduction of the need for pH correction chemicals
- Stand-alone treatment for groundwater applications
- Removal of other anions such as nitrate, bromide, sulfide, arsenic, and chromate

Downstream Process Improvements

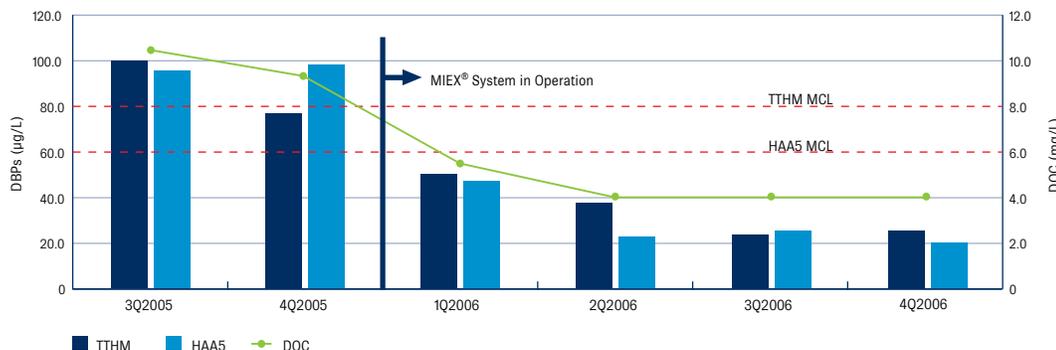
When used as a pre-treatment step, downstream process improvements can be achieved including:

- Reduced sludge and waste production
- Reduced chlorine demand for disinfection
- Reduced chemical demand for downstream coagulation
- Increased capacity of activated carbon
- Improved membrane performance due to reduced fouling

Figure 1: DOC reduction achieved with MIEX[®] treatment and coagulation at full-scale installations.



Figure 2: The DOC removal provided by the MIEX[®] System prior to microfiltration at Big Elk Meadows, Colorado has resulted in significant reductions in Trihalomethanes (THMs) and Haloacetic Acids (HAAs).



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



Visit our website at www.ixomwatercare.com or contact your nearest Ixom office for more information or to inquire about a specific application.

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