

Counter Current MIEX[®] Treatment System

for High Capacity Ion Exchange Applications

V0608

Applications

The MIEX[®] Technology provides the most environmentally sustainable ion exchange process commercially available due to significantly lower energy requirements, salt consumption and waste residuals. The continuous regeneration of resin in this process also eliminates the risk of chromatographic peaking (contaminant dumping) that can occur with traditional packed bed ion exchange processes.

The Counter Current MIEX[®] System has been developed to continue to provide these benefits in applications where very high contaminant removals are required or competing anions such as sulfate make it difficult to achieve a desired removal rate using a standard High Rate MIEX[®] System.

Process Description

The counter current MIEX[®] System consists of two or more High Rate fluidized bed reactor vessels connected in series. Raw water flows from vessel to vessel being contacted with resin of a higher capacity in each subsequent reactor vessel. Fresh regenerated resin is fed to the final reactor vessel while loaded resin is removed from this vessel at the same rate and sent to the preceding vessel. Loaded resin from the first reactor vessel in the series is sent to regeneration, hence providing a counter current MIEX[®] Resin treatment system (Figure 2).

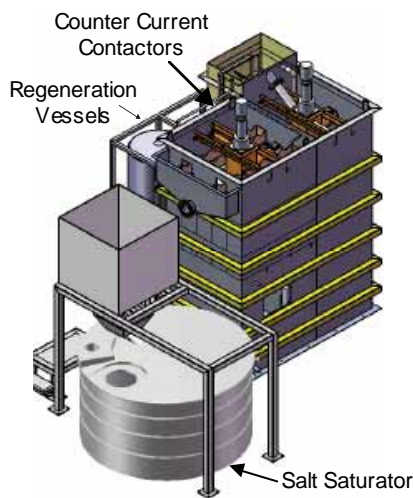


Figure 1: Counter Current MIEX[®] System

current contacting of raw water with MIEX[®] Resin allows more selective competing anions to be removed with partially loaded resin in the first reactor vessel so that fresh resin added to the final reactor vessel will remove less selective target anions such as nitrate and bromide. This configuration can also be used to remove high levels of more selective anions. The more efficient sequential loading of MIEX[®] Resin reduces the regeneration system size that would otherwise be required for challenging contaminant removal using a standard High Rate MIEX[®] System, allowing significant reductions in waste volumes, salt consumption and operating costs.

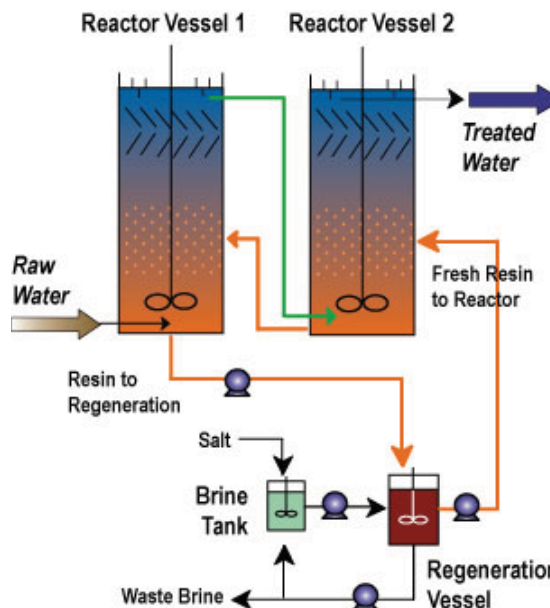


Figure 2: Flow diagram of Counter Current MIEX[®] Process

System Sizes

Counter Current MIEX[®] Systems are available in plant sizes from as low as 25 gpm to at least 50 MGD. Counter current MIEX[®] Systems can be supplied as atmospheric/gravity flow systems for plant sizes of at least 50 MGD and as pressurized systems

for plant sizes up to 10 MGD capacity. Skid mounted packaged systems are available in module sizes up to 700 gpm while systems greater than 2 MGD are typically custom designed.

Background

A trial was conducted at Indian Hills Water District, Colorado (IHWD) to compare the nitrate removal performance of a standard High Rate MIEX® System versus a Counter Current MIEX® System. The objective of this trial was to reduce nitrate levels to less than 6.0 mg/L (as N) on average, providing a comfort margin below the EPA standard of 10 mg/L (as N). It was also important at this site to minimize waste brine volumes as it would be necessary for IHWD to haul away the waste for a fee for off-site disposal and there was a desire to minimize truck movements in this small mountain community. A conventional packed bed ion exchange system had been ruled out by IHWD due to an order of magnitude greater waste volume that would be produced compared to a MIEX® System.

Trial Results

Both MIEX® Treatment systems successfully lowered the nitrate level to below the target of 6.0 mg/L as N (Figure 3) achieving an average treated water level of around 5.5 mg/L. The nitrate removal target was achieved using the standard High Rate MIEX® System at a treatment rate of 100 Bed Volumes (BV*) and with the Counter Current MIEX® System at a treatment rate of 150 BV.

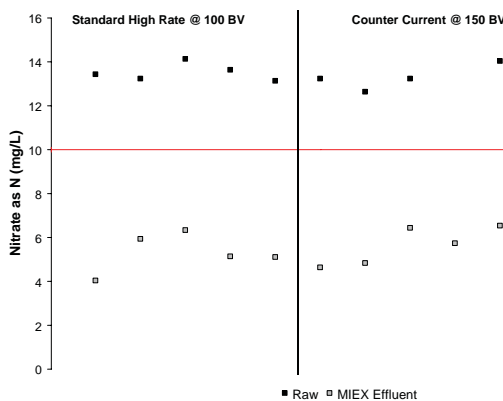


Figure 3: Indian Hills Water District Trial Results

The resulting salt usage and waste volumes that would be produced by a MIEX® System at these treatment rates, and compared to a traditional packed bed ion exchange system are summarized as follows:

	Std High Rate MIEX® System (100 BV)	Counter Current MIEX® System (150 BV)	Packed Bed IEX System
Salt Use (lb/MG throughput)	3000	2000	12,000
Waste Volume (gal/MG throughput)	2500	1650	20,000

Conclusions

The Counter Current MIEX® System allowed the nitrate removal target to be achieved at a lower resin regeneration rate compared to the standard High Rate MIEX® System due to more efficient resin loading in this configuration. A Counter Current MIEX® System was subsequently chosen for nitrate removal at Indian Hills Water District due to lower waste volumes, salt use and subsequently reduced operating costs. The resin smaller regeneration equipment that will be required for the Counter Current System will more than offset the cost for an additional reactor vessel.