Case Study

Newport Water District
Newport, Maine

IXOM WATERCARE

Client

Newport Water District

Project

DOC Removal/DBP Reduction

Location

Newport, Maine

Commission Date

2009

Engineer

Wright-Pierce

Figure 1: The Newport Water District water treatment plant

Newport Water District's experience demonstrates that the MIEX® Process can be an attractive pretreatment option

Project Summary

The Town of Newport is a community of just over 3000 residents located in Penobscot County, Maine. Newport Water District treats water from Nokomis Pond, which contains high levels of dissolved organic carbon (DOC), the precursor material to disinfection by-product (DBP) formation. An administrative consent order from the State of Maine for Stage 1 D/DBP Rule non-compliance prompted the district to attempt to secure sufficient groundwater to replace Nokomis Pond as the district's drinking water source. When that effort was not successful, the town engaged engineer Wright-Pierce to evaluate treatment alternatives to reduce DBP formation.

Newport Water District's existing slow sand filtration water treatment plant influenced the selection of treatment alternatives which included the addition of either ozone/BAC or the MIEX® Process. Both processes were piloted at Nokomis Pond during 2007. Process selection was driven by factors including treated water quality, life-cycle costs, process temperature dependency, and residuals disposal. Based on these factors, the MIEX® Process was selected by the Newport Water District and commissioned in 2009.

Challenge

Slow sand filters were constructed at the Newport Water District in 1994 to provide turbidity removal for the town. The schmutzdecke, or biological layer, that forms on slow sand filters aids in filtration and also provides some degree of DOC removal, often up to 20-30%. With the Nokomis Pond raw water DOC fluctuating seasonally and often reaching concentrations of 5 mg/L or more, the slow sand filters were not able to remove sufficient DOC to comply with the requirements of the D/DBP Rule. A search for an alternative water source proved unsuccessful, leaving installation of additional treatment the town's most viable option for DBP compliance.

Engineer Wright-Pierce was tasked with identifying treatment options that would reduce DBP formation as well as; be compatible with slow sand filtration, not be affected by seasonal temperature swings, and generate minimal residuals that could be effectively handled on-site, due to the absence of a sewer connection within 7 miles of the water treatment plant.

IXOM

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

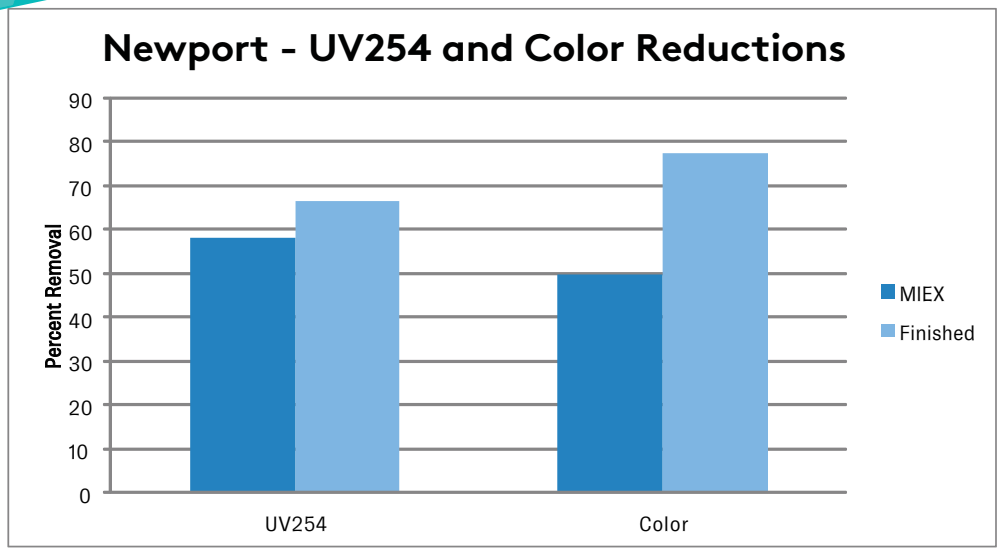

Figure 2: MIEX® Treated and Finished Water UV254 and Color reduction

The options evaluated at the pilot scale included ozone/BAC and the MIEX® Process. The MIEX® Process evaluation included the use of sodium bicarbonate for regeneration, as an alternative to salt, in order to facilitate disposal of the residual to an onsite leachfield. While both processes resulted in water quality compliant with DBP Rule requirements, the MIEX® Process was ultimately selected by Newport Water District due to its process performance being independent of temperature, simplified residuals management using sodium bicarbonate for regeneration, and competitive process life-cycle costs.

Solution

The 0.6 MGD MIEX® System was commissioned at Newport Water District in June 2009. Newport's system was the first in North America to use sodium bicarbonate as the primary regeneration compound. The MIEX® System is applied as pretreatment to slow sand filtration in order to increase DOC removal and reduce DBP formation. The slow sand filters are followed by disinfection with free chlorine. The system is able to reduce the treated water DOC to a concentration of less than 1.5 mg/L. The UV254 absorbance is also consistently reduced by 60-70%. This has resulted in substantial reductions in DBP formation, as well as reductions in raw water color and chlorine demand.

Additionally, Newport Water District has successfully demonstrated the use of sodium bicarbonate regeneration of the MIEX® Resin. The sodium bicarbonate regenerant allows the plant to blend residuals from the MIEX® Process with other plant residual streams for disposal to an on-site leachfield. To more fully clean the resin, periodic sodium chloride regeneration is performed on a quarterly basis.

Project Outcome

The MIEX® System has succeeded in providing Newport Water District with water that meets D/DBP Rule requirements while adhering to site specific requirements for residuals generation. The result is a system that:

- Reduces DOC to <1.5 mg/L, allowing Newport Water District to reduce DBP formation
- Reduces UV254 absorbance by 60-70%
- In combination with slow sand filtration, reduces the True Color of the treated water to <2 CU
- Demonstrates successful operation of sodium bicarbonate regeneration of the MIEX® Resin
- Provides pretreatment to a slow sand filtration system

Newport Water District's experience demonstrates that the MIEX® Process can be an attractive pretreatment option to increase DOC removal and reduce DBP formation for slow sand filtration systems.

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