



MIEX[®] PRESS



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Letter from the editor

Welcome to the August 2007 issue of MIEX[®]PRESS! Although the summer months are quickly coming to a close, our piloting season shows little signs of letting up.

Additionally, projects continue to move from design to construction, as we prepare for the start-up of 4 new MIEX[®] Installations in the U.S. by the end of this year. Also, in Australia, the most recent High Rate System came on-line in April serving Kangaroo Island, SA.

As for conferences, the ACE07 in Toronto was a great success, generating much interest around the MIEX[®] Technology. WQTC, coming up in November, will build on that momentum as numerous papers will be presented on the MIEX[®] Process.

We hope this issue of MIEX[®]PRESS finds you all well. Please contact me with any questions about the featured articles.

Best Regards,

Stephanie Schneider
www.miexresin.com

New MIEX[®] Installation On-line at Kangaroo Island, AU



The MIEX[®] Middle River Plant on Kangaroo Island, which is operated by co-developer of the MIEX[®] Process, South Australian Water Corp, commenced water production in South Australia in April 2007.

According to acting Minister for Administrative Services and Government Enterprises John Hill, the Middle River project "will bring benefits to the tourism industry and support future

residential development on Kangaroo Island."

SA Water Chief Operating Officer John Ringham, says the new plant will improve the quality, color and taste of the water and result in a lower use of aluminum and chlorine in the water treatment.

Construction for the \$4.5M upgrade began in late 2006. The 3MLD (~550 gpm) High Rate MIEX[®] System is now benefiting more than 3,200 residents on Kangaroo Island and is the latest High Rate system to come on-line.

3rd Ohio MIEX[®] Installation

The Burr Oak Regional Water District in Glouster, Ohio recently procured a 2.4 MGD High Rate MIEX[®] System to come into compliance with the Stage 1 DBP Rule by January 2008. The system is being engineered by Alan Brown P.E. of M E Companies in New Lexington OH and is expected to be operational in December 2007. This is the 3rd MIEX[®] System to be approved in Ohio following Napoleon and Portsmouth which are currently in construction.

WQTC 2007 Papers

Adsorption, Ion Exchange & Characterization of Organic Compounds, WED10

1) Stoichiometric Removal of Disinfection Byproduct Precursors by Ion Exchange
Treavor Boyer

5) Integrated Analysis of NOM Removal by Magnetic Ion Exchange
Philip Singer, U of N. Carolina- Chapel Hill

6) MIEX Treatment of Polarity Based Fractions of Natural Organic Matter from a Western Australian Groundwater
Stacey Hamilton, Curtin Water Quality Research Centre

Posters

MON2 Does MIEX Improve the Removal of Algae Metabolites Using Granular Activated Carbon?
Mary Drikas, Australian Water Quality Centre

MON12 Impact of MIEX Pretreatment on Downstream Conventionally Treated Water Quality Parameters
Nicole Charlton, Paul Kohl, Susan Yi, Philadelphia Water Department

TUES2 Installation of a High Rate Magnetic Ion Exchange Process to Bring a Groundwater System into Compliance with the Stage 1 DBPR
Michael Bourke, Neal Williams, Orica Watercare Inc.

Carrabelle Pilot Turns into Two Orders

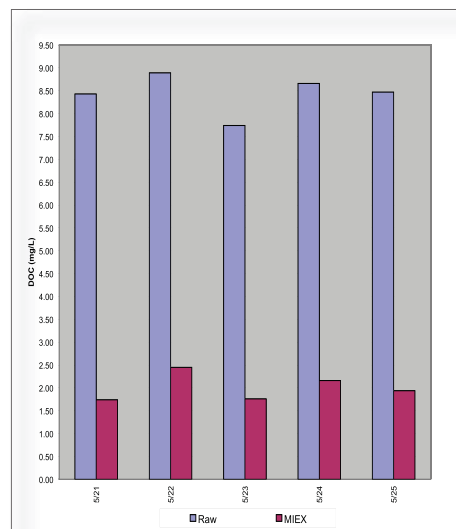
Picturesque Carrabelle, a small town located in the panhandle along Florida's "forgotten coast," recently conducted a pilot plant trial of the High Rate MIEX[®] Process to investigate the ability to reduce the formation of disinfection by-products (DBPs).

Carrabelle, FL - The City of Carrabelle required a treatment process that could improve the water quality from its existing treatment plant and also be utilized on a future well supply. The City's engineer, Camp Dresser & McKee (CDM) arranged for samples from several wells to be sent to Orica Watercare's headquarters in Watkins, CO for preliminary jar testing in April 2007. The results looked favorable, and preparations began to pilot the High Rate MIEX[®] Process in Carrabelle. From May 21st through June 6th, 2007 a trial was conducted in Carrabelle on two separate groundwater wells: Well #4 and SJB (St. James Bay) Well. The primary objective of this MIEX[®] Pilot trial was to remove DOC and therefore reduce the formation of Disinfection By-Products (DBPs). A secondary objective was the removal of iron. The MIEX[®] Process was used in front of an iron oxidation / filtration unit for the duration of the pilot to assist in this treatment objective. During the study, the MIEX[®] Unit was operated with a contact time of 3 minutes and the resin regeneration rate was varied from 1.4 to 2.5 gallons of resin per 1,000 gallons of water treated (700 to 400 BV). The system was operated for eight days on Well #4, considered to be a more problematic well, before being moved to the SJB Well for the final six days of the trial.

Trial Results:

Throughout the trial the MIEX[®] pilot plant consistently reduced the raw water DOC level in Well #4 by 71%, from an average level of 7.64 mg/L to an average of 2.18 mg/L. The SJB Well average DOC reduction was 69% from 3.04 mg/L to 0.955 mg/L.

The reduction in DOC provided an 87% reduction in the treated water simulated distribution system (SDS) TTHM formation



Graph 1: DOC Reductions at Well #4 at the City of Carrabelle, FL

potential and a 93% reduction in the SDS HAA5 formation potential in Well #4. The SJB well had reductions of 85% for SDS TTHMs and 86% for SDS HAA5s. These reductions should reduce distribution DBP levels to well within the EPA standards using current disinfection practices.

MIEX[®] Resin treatment allowed raw water iron levels to be reduced by 43% in Well 4 and 39% in the SJB Well. While the levels were still over the EPA secondary MCL, the lower iron level should reduce the loading on the iron oxidation / filtration system downstream, and therefore reduce the frequency of backwashing.

Following the successful trial, an order was received in August for two High Rate MagnaPak Systems for the City of Carrabelle. A 700-gpm unit will be installed at Well #4 while a 350-gpm unit will be installed at St. James Bay Well. Expected commissioning for the two plants is set for 1st quarter 2008.

Chloramines- The Good & The Bad

by Beth Pyles

In an effort to comply with EPA DBP requirements, more and more water facilities have been switching disinfectants from free chlorine to chloramines, which are formed by mixing chlorine and ammonia. Chloramines offer some distinct advantages over free chlorine. As chloramines are weaker oxidants than chlorine, there are generally less reactions with organic matter, resulting in the formation of fewer regulated DBPs. The lower reactivity of chloramines also allows residuals to last much longer in distribution systems.

Chloramines are not, however, without their own disadvantages. Though chloramines are safe for consumption in drinking water because digestion neutralizes them before they enter the bloodstream, other forms of intake can be dangerous. For example, chloramines have been shown to interfere with the proper absorption of oxygen if taken directly into the bloodstream; for this reason, they cannot be present in water used for kidney dialysis. Similarly, chloramines are toxic to fish (both freshwater and saltwater), reptiles, and amphibians.

Unregulated DBP Formation

Laboratory tests have also shown that chloraminated water contains concentrations of dissolved organic halogens (DOX), but many of these DOX constituents have yet to be fully identified. Although chlorine has been used to disinfect water for over 100 years, less than 50 percent of the DBPs in chlorinated drinking water are known. Only 17 percent of the DBPs formed by chloramines have been identified.¹

Chloramines are known to form many non-halogenated DBPs. Two

such species related to chloramines are: iodoacids and nitrosamines. Iodoacids have been categorized as the most toxic and DNA-damaging DBP in mammalian cells, while Nitrosamines can be 100–10,000-fold more carcinogenic than THMs. The best known of these nitrosamines is N-nitrosodimethylamine (NDMA), but researchers have recognized the need to search out other known and unknown forms of nitrosamines to determine whether they too are problematic.

Only 17 percent of the DBPs formed by chloramines have been identified.

Links to Increased Lead Levels

Recently, switching to chloramines has been linked to excessive lead and copper corrosion. While the chloramine compound itself does not increase the potential for corrosion there are two ways in which the use of chloramine can indirectly affect corrosion of lead and copper. First, when chloramine is used in water treatment as a residual disinfectant, it can change the chemical properties of the water, which subsequently can impact lead and copper corrosion. Certain conditions related to pH, alkalinity, and dissolved inorganic carbonate levels in the water can cause lead to dissolve from pipe material. Secondly, chloramines eliminate free chlorine. Experts suspect that free chlorine actually serves as a form of corrosion control treatment. The hypothesis is that it is the free chlorine that is contributing to metal leaching. Elemental chlorine

combines to form an oxide with lead or copper to create a protective layer inside distribution system pipes/plumbing, slowing the rate of lead corrosion.

Nitrification Risks

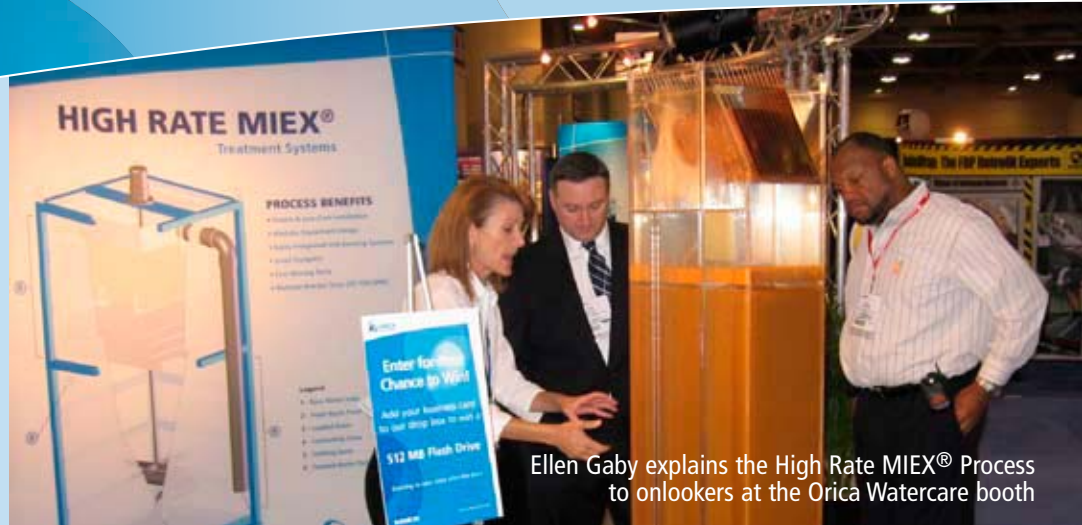
Another potential adverse outcome of chloramination is nitrification within the distribution system. Nitrification is a two-step microbial process that involves the conversion of ammonia to nitrite, and then nitrite to nitrate. The risk of nitrification is particularly high where water temperatures are warm (25-30 deg C) and distribution detention times are long. Indicators of the occurrence of nitrification are a loss of disinfectant residual and an increase in HPC bacteria growth. The presence of nitrite or nitrate in the water supply can have acute health impacts causing methemoglobinemia, or blue baby syndrome, which is a blockage of oxygen transport in the bloodstream.² At greatest risk are infants below six months of age and those suffering from a genetic deficiency of certain enzymes. Pregnant women may also be at a higher risk of methemoglobinemia than the general population.

Given the conflicts water utilities now face on how to reduce the abundant known and unknown DBPs and keeping lead and nitrate levels low, perhaps the best solution is removing the precursors from the source water and staying with free chlorine.

Article Resources

- 1 Dr. Michael J. Plewa, genetic toxicologist, U. of Illinois
- 2 Nitrification Occurrence and Control in Chloraminated Water Systems [Project #710]

The ACE07 in Toronto generated lots of interest in MIEX® Treatment solutions while also providing us with great opportunities to catch up with existing customers and develop new relationships.



Ellen Gaby explains the High Rate MIEX® Process to onlookers at the Orica Watercare booth

Chloride-Free Regeneration of MIEX® Resin

You may not realize it but there are a number of different ways to regenerate MIEX® Resin other than with sodium chloride.

If it is preferred to not have sodium in the waste brine, potassium chloride (KCl) or magnesium chloride (MgCl) can be used instead and in some cases this may allow for more beneficial use of the waste.

It is even possible to regenerate MIEX® Resin with a non-chloride solution such as sodium bicarbonate (NaHCO₃), eliminating the presence of chloride in the waste brine altogether. In using sodium bicarbonate, the MIEX® Resin is used in the bicarbonate form rather than the chloride (Cl⁻) form where a bicarbonate ion (HCO₃⁻) rather than a chloride ion is exchanged for target anions such as organic acids and nitrate. Recently completed pilot trials in California and Florida have demonstrated that

sodium bicarbonate regeneration allows the MIEX® Resin to be just as effective at DOC removal as when using sodium chloride.

California State Project Water Trial – June 2007

Following a trial conducted using conventional NaCl regeneration, the resin regenerant was changed to NaHCO₃ to determine if there was any impact on DOC/TOC removal and the subsequent SDS THM formation potential of the treated water. At similar numbers of regenerant reuses, the TOC removal was the same for each regeneration method at about 59% resulting in similar SDS THM levels.

St Cloud Florida Trial – July/August 2007

Two pilot plants were used in side-by-side trials to compare treatment performance using NaCl and NaHCO₃ for resin regeneration. A 9 MGD full-scale MIEX® System is currently under construction at St. Cloud and the purpose of this trial was to determine if NaHCO₃ can be used at this plant to reduce the chloride loading on the receiving sewage plant. This trial demonstrated identical performance of the two pilot plants with around 60-65% removal of TOC provided by each.

So do not be concerned that sodium chloride is the only option available for the regeneration of MIEX® Resin. If brine waste disposal (or reuse) would be easier if the sodium or chloride was not present, contact Orica Watercare to see how an alternative regenerant could be applied to your particular application.

Trade Show Schedule, Fall 2007

Rocky Mountain	September 9-12	Orica Watercare Booth
Wisconsin AWWA	September 12-14	Shared Booth with Peterson & Matz
Ohio AWWA	September 18-21	Shared Booth with Smith Environmental
ACWWA Conference	Sept. 30- Oct. 1	Shared Booth with Atlantic Purification Systems
AL/MS AWWA	October 7-9	Shared Booth with Eco-Tech
CA/NV AWWA	October 22-25	Orica Watercare Booth
WQTC	November 4-8	Orica Watercare Booth
FL AWWA	November 11-15	Shared Booth with Moss Kelley