

Background

The MIEX® Process is a proven technology for the removal of dissolved organic carbon (DOC) from potable and wastewater sources. Occasionally, waters are found to contain an intractable fraction of organic carbon and in such instances, the performance of the MIEX® Technology can be enhanced with ozonation.

Ozonation is believed to be effective in partially oxidizing organic material and increasing the polarity of these organics. The charged species are then more amenable to removal using MIEX® Resin. The following tests demonstrate this principle.

Tests

Various water and effluent samples were treated with MIEX® Resin alone, ozonation pretreatment alone and MIEX® Resin in conjunction with ozonation pretreatment. After each of these treatments, DOC content was measured, compared with the DOC content of untreated samples and the resulting DOC removal rates compared.

The ozonation pretreatment consisted of bubbling ozone through a sample at the rate of 10 L/hour. Ozone was generated using Fischer Oz 500 MM and samples of specified volume were exposed to ozone at two dosages. After every step, UV absorbance of the samples at 254 nm was measured and from these measurements, DOC values were calculated.

MIEX® Resin was applied to the pretreated samples at a dose of 5 mL/L for a period of 20 minutes. After treatment, each sample was filtered and tested for DOC content.

Results

Water samples from different sources have been tested and four are presented in the following tables. This series of tests demonstrates that the combination of ozonation and MIEX® Resin treatment provides superior DOC removal when compared to application of either MIEX® Resin or ozonation individually.

Treatment of Textile Dyeing Effluent 1 using the ozonation alone was found to reduce DOC by 17% while ozonation in combination with MIEX® Process was found to have the greatest effect, reducing the DOC in the treated effluent by 25% under the same pretreatment conditions. Similar results were obtained for potable water, where combining ozonation pretreatment step with the MIEX® Treatment resulted in a significant increase in DOC removal from the samples.

A significant reduction in UV absorbance was also observed when ozonation pretreatment step was incorporated in treatment of effluent samples from paper recycling and dairy processing.

Textile Dyeing Effluent 1 (250 mL)	% of DOC Reduction
MIEX®DOC	< 5
Ozone (6 hours)	16.9
Ozone (6 hours) + MIEX®DOC	24.5

Potable Water (350 mL)	DOC, mg/L
Untreated (control)	18.8
Ozone (1 hour)	7.88
Ozone (1 hour) + MIEX®DOC	4.98

Paper Recycling Effluent (150 mL)	% Reduction of UV Absorbance at 254 nm
MIEX [®] DOC	46.5
Ozone (6 hours) + MIEX [®] DOC	88.1

Dairy Factory Effluent (350 mL)	UV Absorbance at 254 nm
Ozone (1 hour)	0.0133
Ozone (1 hour) + MIEX [®] DOC	0.0013
Ozone (2 hours)	0.0160
Ozone (2 hours) + MIEX [®] DOC	0.0030

Summary

Ozonation as a pretreatment to the MIEX[®] Technology has been shown to improve the removal of dissolved organic carbon from a number of different water sources. The combination of MIEX[®] Resin with ozonation pretreatment provides a treatment option for the removal of difficult to treat organics.