

## Advanced Oxidation Pretreatment for the MIEX<sup>®</sup>DOC Process

### BACKGROUND:

The MIEX<sup>®</sup>DOC Technology was designed for the removal of dissolved organic carbon (DOC), a precursor to the formation of THMs and HAAs, from drinking water supplies. More recently, the MIEX<sup>®</sup> Technology is finding many more applications for the removal of a range of contaminants across many industries.

Occasionally, there are waters where the removal of DOC or other dissolved organic compounds using MIEX<sup>®</sup>DOC Resin can be enhanced using advanced oxidation pretreatment (AOP). In these instances, the waters are found to contain an intractable fraction of organic carbon that is not amenable to removal by ion exchange.

Advanced oxidation is believed to be effective as it converts some of this fraction to organic acids, which can then be removed using MIEX<sup>®</sup>DOC Resin.

The following tests demonstrate this principle.

### TESTS:

A raw water sample from Airey's Inlet Water Treatment Plant in Victoria Australia, was tested with MIEX<sup>®</sup>DOC Resin alone, advanced oxidation pretreatment alone and MIEX<sup>®</sup>DOC Resin in conjunction with an advanced oxidation pretreatment. DOC in the raw water and after each of these treatments was measured and the resulting DOC removal rates compared.

The advanced oxidation pretreatment consisted of adding 50% hydrogen peroxide solution to the water and then exposing the water to UV irradiation for a period of approximately 60 minutes. The hydrogen peroxide solution was dosed such that the active concentration of active H<sub>2</sub>O<sub>2</sub> in the water was equal to half that of the DOC (ie. 0.5 g H<sub>2</sub>O<sub>2</sub>/g DOC). MIEX<sup>®</sup>DOC Resin was applied to the pretreated water and a raw water control, at a dose of 0.8 mL/L for a period of 20 minutes.

After treatment, each water was filtered and tested for DOC content.

### RESULTS:

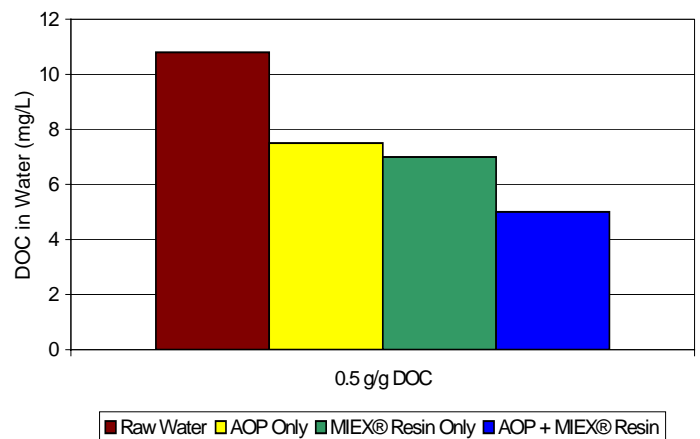
The results are shown in Figure 1.

The raw water contained 10.8 mg/L DOC. Treatment by MIEX<sup>®</sup>DOC Resin alone at a dose of 0.8 mL/L was found to reduce the level of DOC in the water by 35% to 7.0 mg/L.

Treatment using the advanced oxidation approach alone was found to reduce DOC by 30%. However, AOP in combination with MIEX<sup>®</sup>DOC Resin was found to have the greatest effect, reducing the DOC in the treated water by 54%, to 5.0 mg/L under the same oxidation pretreatment conditions.

This series of tests demonstrates that the combination of AOP (hydrogen peroxide followed by UV irradiation) and MIEX<sup>®</sup>DOC Resin provides treatment benefits over the application of either MIEX<sup>®</sup>DOC Resin or the advanced oxidation pretreatment individually.

**Figure 1. Airey's Inlet AOP/MIEX<sup>®</sup> Resin Results**



### SUMMARY:

The combination of MIEX<sup>®</sup>DOC Resin with advanced oxidation pretreatment is a viable option for organics removal where the organic component of a water is not amenable to removal by ion exchange.

In addition, the advanced oxidation pretreatment has been shown to improve organics removal rates from condensate streams in dairy applications using MIEX<sup>®</sup>DOC Resin from less than 20% to greater than 80%, and there is also potential for this treatment combination in other industrial applications, such as the food and beverage and pulp and paper industries.

The MIEX<sup>®</sup>DOC Process can also be used with other advanced oxidation pretreatment strategies, such as ozonation, for the conversion and removal of organic from a range of waters.