

# Advanced Oxidation Processes & MIEX® Treatment For Dairy Wastewater Treatment / Recycling

## DOC in Dairy Processing Wastewaters

During production of milk powders, cheese, whey and lactose products, considerable amounts of wastewater are generated due to the large volume of water present in raw milk (approximately 80-90%). Recovering this wastewater can potentially provide 95% of water volume requirements for dairy processing. However, dissolved organic carbon (DOC) present in these wastewaters, typically comprised of dissolved milk solids, is difficult to remove via conventional treatment methods.

The MIEX® Technology can be used in combination with advanced oxidation processes (AOPs) to remove DOC from dairy wastewaters that can cause fouling or promote biological growth in downstream process equipment if it is recycled without prior treatment.

This bulletin demonstrates the synergy between AOPs and MIEX® Treatment for removing DOC from dairy wastewater, thus enabling reuse in numerous plant areas, including:

- Boiler and cooling tower feed water
- Clean in place (CIP) systems
- Reconstitution of powdered products
- Cheese curd wash water
- Dryer wet scrubbers
- Indirect heating (via heat exchange)
- Pump seal water.

## The MIEX® Solution

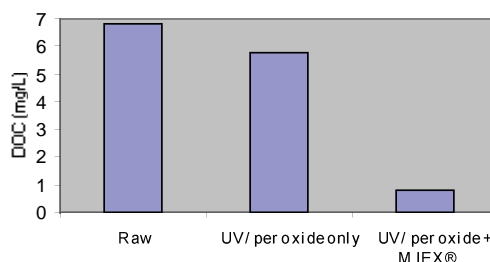
One method of applying AOPs is to combine ultraviolet light (UV) with peroxide dosing. The application of peroxide causes degradation of organic micro-contaminants and the UV light acts as an energy source to catalyse the degradation.

MIEX® (Magnetic Ion EXchange) Resin is an anion exchange resin, where a chloride ion exchanges with contaminant ions (i.e. DOC) that occupy the active site on the resin bead. The resin is applied in a mixed contact vessel with very high water velocities, up to 30 m/hr. The process is continuous, where fresh resin is constantly fed into the process while a side stream

is simultaneously removed for regeneration. Therefore, the process never reaches exhaustion and the treated water quality remains consistent. Resin is regenerated with a brine (NaCl) solution, which removes the contaminants from the resin bead and replaces the chloride ions. In cases where conductivity increases across the treatment process must be minimised, the resin can be put into the bicarbonate form and regenerated using NaHCO<sub>3</sub>.

Pre-treating wastewater with AOPs acidifies the organic contaminants, making them more amenable to removal via MIEX® Treatment. Applying UV/ Peroxide before MIEX® Treatment results in the breakdown of organic matter, causing production of carboxylic groups. These carboxylic compounds lead to the formation of anionic products removable by the MIEX® Resin.

Combining these technologies allows for each process to be optimized, thus keeping capital and operating costs to a minimum. This treatment train can achieve up to 90% reduction in DOC, as demonstrated in the figure and table below.



Effluent Type	Raw Water DOC (mg/L)	MIEX® Treated DOC (mg/L)
Condensate	6.8	0.8
RO Permeate	89.3	9.8

## MIEX® Treatment Systems

MIEX® Systems come as packaged units up to 2 MGD (~8 MLD) or custom-designed systems for all capacities over 2 MGD. Feasibility studies can be conducted on water sources to determine the optimum performance of the MIEX® Process and appropriate system design parameters.