American Water Chemicals®

CASE STUDY

Water Source Wastewater Reuse
Treatment type MF followed by RO
Industry Municipal
Service Membrane Autopsy | Cleaning Study | ROSSEP
Chemicals AWC C-227 | AWC C-209 | AWC A-110

AWC Extends the Time Between Cleanings for Water Reuse RO in Northern California

The Facility

An 8 MGD wastewater reuse facility in Northern California employs 4 Reverse Osmosis trains. Each train consists of 2 stages with a train configuration of (52x7) -> (28x7) and is currently operated at 80% recovery.

The plant purifies water to California drinking water standards and this very low TDS water is then used to dilute the higher TDS recycled water produced by the regional wastewater facility, making it ideal for irrigation.

RO Model	CSM RE8040-FE
Membrane Type	Fouling Resistant RO
Train Configuration	52x7 -> 28x7
Pre-treatment	Multimedia Filtration

The plant maintained a constant 3 ppm chloramine residual to minimize biofouling and adjusted its feed pH to 6.8 to assist with the control of calcium phosphate scaling. The plant had significantly high orthophosphate and silica levels and had in the past experienced calcium phosphate and silica scaling.

The Problem

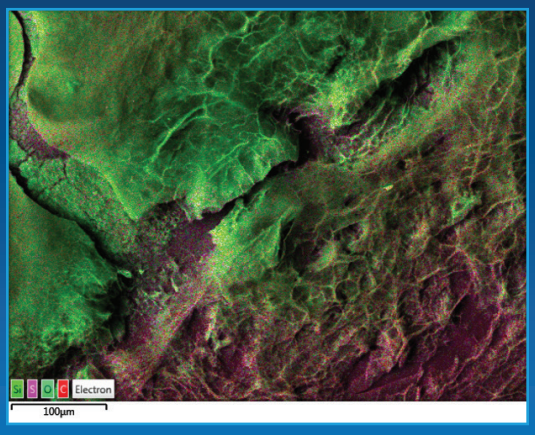
The plant was experiencing frequent fouling characterized by steep feed pressure increases and climbing differential pressures in both stages.

A cleaning was required every 4 to 6 weeks, amounting to 32 cleanings per year. A loss in salt rejection was observed with every cleaning, which was of great concern.

Autopsies were performed on the feed and tail elements. The lead element was coated with a thick, dark foulant that initially appeared to be biological in nature. The tail element was found to have very light deposits of silica scale concentrated at the feed spacer contact points; nothing that would explain the losses in permeability. However, the tail element was coated with a very unusual foulant; it was a clear, colorless gel-like deposit that did not have a good match to biofouling by FTIR. This material was suspected to be a synthetic organic material.

Foulant collection on lead element

Foulant collection on tail element



Superimposed Elemental Imaging (SEI®) of polymerized silica organic based matter

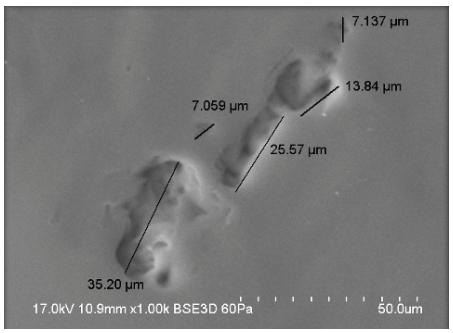
The Solution

A cleaning study was performed on membrane coupons from the autopsy. AWC C-227 was determined to be the most effective high pH cleaner for removing the heavy organic foulants from the membrane surface. AWC C-209 was found to be the most effective at removing silica scale and also reversed membrane swelling caused by the high pH cleaning. However, salt rejection could not be recovered.

A post-cleaning surface analysis identified severe surface abrasion. It was determined that the foulants were covering the surface damage and that the salt rejection increased after every cleaning because the surface damage would be exposed upon foulant removal.

AWC performed a thorough water analysis and ran computer projections using the Proton software. ROSSEP lab simulations were also performed to verify the projections and provide more reliable recommendations.

AWC A-110 was chosen as the most effective scale inhibitor for the application due to its excellent control of phosphate scales, silica scales, and its tolerance to chloramines.



Electron micrograph of the surface damage at 1000X magnification. The size of the surface damage ranged from~7µm to ~35µm Electron

The Results

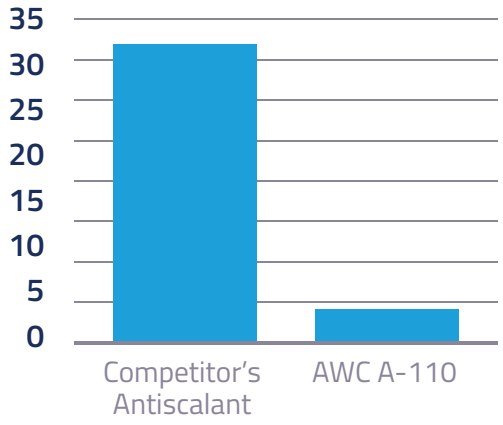
The plant implemented all recommendations provided by AWC. The cleanings successfully returned the plant to normal operating pressures.

AWC-110 antiscalant dosing allowed the plant to extend the time between its cleaning cycles to 10 months intervals. This translated to major cost savings of RO membrane cleaning chemicals as well as reduction of labor hours.

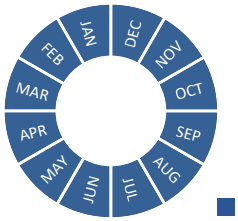
The disappearance of the heavy organic fouling was a clear indication that the prior antiscalant had been contributing to the fouling.

The plant has now been running successfully for several years and is planning to begin increasing its recovery.

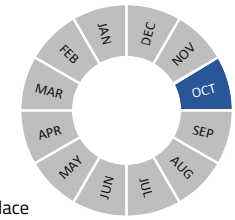
Cleanings per year (4 trains)



Cleaning Cycles Competitor's Antiscalant



Cleaning Cycles AWC A-110



Cleaning In Place

About AWC®

AWC is a solutions provider for the water treatment industry. The company offers an extensive portfolio of membrane chemicals specifically targeted to the needs of its global clients. Some of these chemicals include antiscalants and cleaning chemicals for Reverse Osmosis (RO), Nanofiltration (NF), Ultrafiltration (UF) and Microfiltration (MF). In addition, the company provides a broad range of analytical services including membrane performance testing, cleaning studies and membrane autopsies. The company's service offerings complement the chemical product line and offer unique tools for identifying the exact nature of a scale or foulant. Lab scale simulations are conducted to insure successful scale inhibition and optimal performance of RO/NF membrane systems during full scale operation or piloting.