American Water Chemicals®

Perfecting the science of membrane treatment

CASE STUDY

Recovering a System Severely Scaled with Calcium Sulfate

The Facility

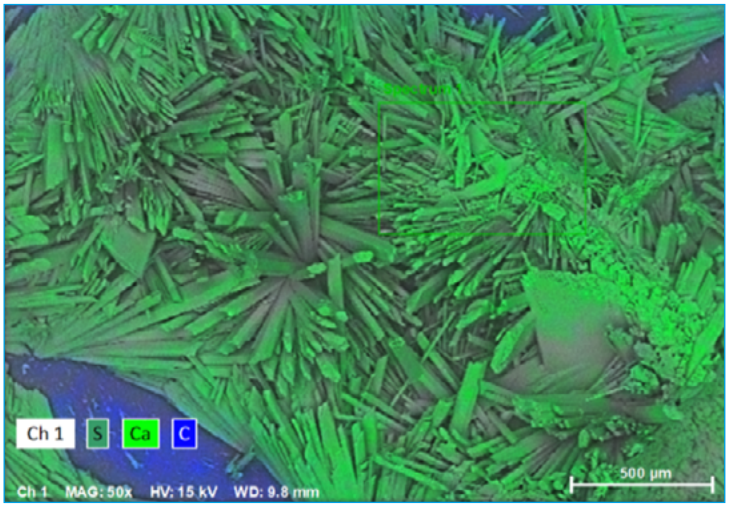
A blueberry farm in South America was using RO treated water from brackish water wells for irrigation. All local wells had extremely high sulfate concentrations.

Water Source — Brackish Groundwater
Treatment type — Reverse Osmosis
Industry — Agro-industrial
Services — Membrane Autopsy | Onsite Cleaning
Chemicals — AWC C-238

The Problem

The original wells which had been selected were abandoned in favor of different wells. However, the water quality of the new wells was unknown and the antiscalant selection and dosage had been based on the original water quality. Furthermore, there were several incidents of antiscalant dosing interruptions, and operation at a recovery rate beyond the design recovery. The feed pressures started to rise suggesting that scaling was forming, and differential pressure across the system climbed to 68 psi (4.7 bar). Permeate water quality was deteriorating as conductivity quickly climbed.

Severe scaling within feed spacers

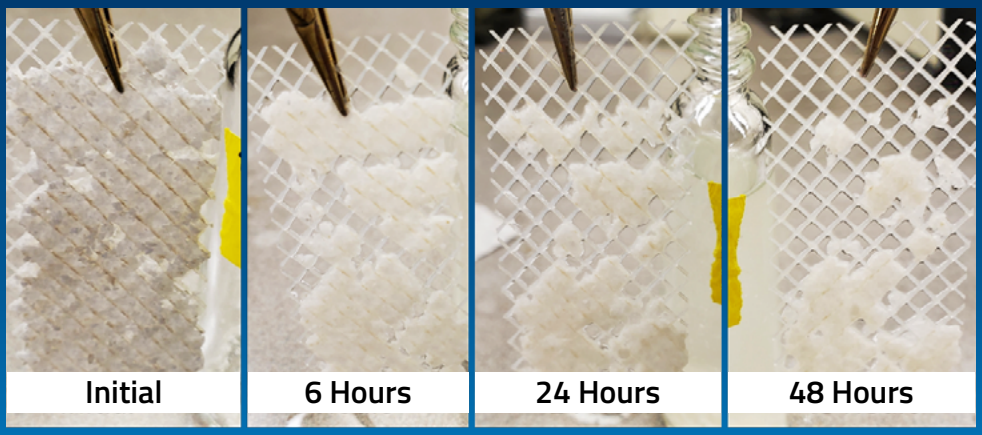


Spectrum 1		Spectrum 1: *Carbon and Oxygen Ignored*	
Element	**Atom (%)**	Element	**Atom (%)**
Oxygen	66.62		
Silicon	0.21	Silicon	0.92
Sulfur	10.66	Sulfur	47.19
Calcium	11.31	Calcium	50.56
Carbon	10.9		
Sodium	0.22	Sodium	0.97
Aluminum	0.08	Aluminum	0.35
	100		**100**

Superimposed Elemental Imaging EDS of severe calcium sulfate scale.

The Solution

When an element was removed for membrane autopsy, it was found to weigh 129 lbs (58.5 kg). It was so severely scaled by calcium sulfate (gypsum) that feed channels were nearly completely closed off. The scale had torn into the membrane leaves, resulting in an irreversible loss in salt rejection. Lab testing was performed to determine the most effective cleaning protocol. AWC's gypsum scale disintegrator, AWC C-238, was found to efficiently break apart the hard crystalline scales to an easily flushable slurry.



Lab testing of calcium sulfate scale disintegrator, AWC C-238.

The Results

With the help of one of AWC's local partners, AWC C-238 was deployed onsite and used to clean the system. During the cleaning, the bag filters were manually cleaned every hour to remove the large masses of gypsum scale that had been released from the membrane elements.

System performance significantly improved post CIP, cutting differential pressure in the system by half without further degrading membrane rejection. Although the final permeate quality was not optimal, it was sufficient for the berry farm to continue using the permeate for irrigation until the membranes could be replaced. AWC C-238 successfully removed all calcium sulfate scale from membranes weighing >100 lbs (>45 kg), an accomplishment unique to AWC within the membrane water treatment industry.

Disintegrated gypsum scale collected in the bag filters.

System Performance			
Parameter	Before CIP	After CIP	Direference from Initial
Feed Pressure (psi)	297.3	248	-17%
Reject Pressure (psi)	229.1	216.1	-6%
Differential Pressure (psi)	68.15	31.9	-53%
Feed Pressure (psi)	1212	1273	-5%
Permeate Conductivity (µS/cm)	840	790	-6%

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.