

Creative Chemistry. Smart Solutions.

Solutions Aren't Always Black & White

Scanning Electron Microscopy
compared to
Chromatic Elemental Imaging



First introduced by Avista Technologies, Chromatic Elemental Imaging (CEI) is a new and revolutionary innovation in membrane autopsy technology that can identify the location and relative concentration of elements in a foulant sample. Used as a troubleshooting tool, CEI can successfully identify and resolve the primary sources of membrane fouling.

We think in color.

A NEW APPROACH TO MEMBRANE AUTOPSY TECHNOLOGY

Pioneered by Avista® Technologies for customers worldwide, Chromatic Elemental Imaging (CEI) is an extremely accurate, high resolution imaging technique that identifies the exact location and concentration of elements in a foulant sample. CEI is excellent for analyzing mixed foulant samples when other analytical tools provide limited results.

In the CEI process, a beam of focused electrons is accelerated across the surface of a foulant sample causing each element to emit electrons. The X-ray patterns emitted are specific to every element, enabling each one to be individually identified.

CEI then assigns a color to each element and produces a three-dimensional, high resolution image of the foulant sample. Element concentration is indicated by color intensity.



A DISTINCT ADVANTAGE

A distinct advantage of CEI is its ability to provide insight into the layering characteristics of foulants deposited on a membrane. By analyzing the layers, it is possible to understand the fouling sequence. When used in combination with Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray (EDX), CEI can reveal the interaction between inorganic, organic, metal oxide and colloidal compounds.

As a troubleshooting tool, CEI is unmatched in its ability to successfully determine the primary membrane foulants, which can help identify process deficiencies to prevent or minimize future fouling. CEI has also accelerated the development of new antiscalants, cleaners and biocides by replacing the process of trial and error with scientific validation of formulations targeting specific foulants.

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CASE STUDY

SEVERE SCALING IDENTIFIED BY CEI

Situation:

Avista® Technologies received a reverse osmosis (RO) element for autopsy to determine why a second stage RO system had experienced a rapid increase in pressure after only six months of operation. This tail element weighed almost 50 pounds (22 kgs) more than a new element, a clear indication of severe scaling. The autopsy revealed crystals on the membrane surface, which Chromatic Elemental Imaging identified as calcium carbonate scale layered on top of silica deposits.

Solution:

Based on a review of an original feedwater analysis, Avista determined that both calcium carbonate and silica were within the inhibition capabilities of the on-line antiscalant. In addition, the antiscalant injection rate was correct, and the system recovery was within design parameters. A new feedwater analysis was completed and revealed that the silica values had doubled over the summer. The higher silica values exceeded the capabilities of the scale inhibitor, which led to the extreme scaling. The CEI discovery of both silica and carbonate allowed Avista to identify the problem and recommend the proper antiscalant to protect the membranes from future scaling.



SUPPORT SERVICES

Avista offers these related services to provide a complete solution for our customers:

- *RO Membrane Autopsies, which include the physical dissection of site-specific membrane samples for laboratory evaluation*
- *RO Cleaning Studies to evaluate the effectiveness of cleaners under representative cross flow conditions*
- *MF/UF Cleaning Studies to determine the efficacy of existing cleaners compared to Avista formulations or new chemistries that address site-specific foulants*
- *MMF Lab Filtration Studies to enhance performance and predict expected full-scale performance*
- *On-call membrane system troubleshooting support*
- *Chemical application recommendations based on a review of operating data, feedwater analysis, on-site chemicals or autopsy results*

**CLARITY
THROUGH
COLOR**



EXPERIENCE "CLARITY THROUGH COLOR" YEAR-ROUND WITH OUR CEI CALENDAR WALLPAPERS.

Visit www.chromaticelementalimaging.com to download a jpeg file for your desktop, laptop, tablet or smartphone.



For more information on CEI, visit:
www.avistatech.com/cei



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www.avistatech.com

CORPORATE OFFICES

Avista Technologies, Inc.
140 Bosstick Boulevard
San Marcos, California 92069
United States

Tel. | +1.760.744.0536

Avista Technologies (UK) Ltd
13 Nasmyth Square, Houstoun Industrial Estate
Livingston, EH54 5GG
United Kingdom

Tel. | +44 (0) 131 449 6677