Analytical Services Laboratory

FACT SHEET

Membrane fouling and scaling are the most common problems in Reverse Osmosis and Nanofiltration systems.

To monitor potential scaling, common ionic species, such as calcium, magnesium, bicarbonates, and sulfates, should be analyzed on a regular basis. On-site laboratory capabilities generally provide an adequate level of confidence in measuring these levels of ions.

Other salts present in very low concentration and with low solubility should also be monitored to minimize the scaling risk. These ions, such as strontium, barium, and fluoride, are more difficult to analyze on-site.

Metal ions may also foul membranes, and their presence, even at low concentrations, should be monitored. Iron, aluminum, and manganese are the most common, but others may be present.

Colloids, such as colloidal silica, are also a potential factor in fouling due to their small particle size, sometimes smaller than the pore size of cartridge filters used in RO systems. Additionally, organic contaminants such as humic and fulvic acids, oil, and grease could be present in surface or process waters.

Deposits observed on multimedia filters, cartridge filters, Silt Density Index (SDI) pads, or reverse osmosis membranes should also be analyzed to identify deposit components.

Veolia has state-of-the-art laboratories and the scientific expertise to analyze potential foulants of reverse osmosis processes.

The Veolia Analytical Services Laboratory offers comprehensive industrial, analytical services to fit customer needs. All testing methods comply with rigorous QA/QC protocols for method and result validation.

Our services include:

Water Analyses

The Analytical Services laboratories can measure a wide range of parameters to trace levels using an extensive range of instruments:

- ICP-OES and AAS are spectrophotometric techniques to measure a wide range of elements with detection limits down to low ppb levels depending on the element and sample matrix.
- Ion Chromatography includes rapid liquid chromatography separations of ions (e.g. Cl^-, F-, NO_2^-, NO_3^-, SO_4^{2-}) in columns coupled online with detection and quantification in a flow-through detector.

- Segmented Flow and Discrete Analyzers are colorimetric techniques used to determine concentrations of a wide range of anions or cations (NH_4^+, Cl^-, NO_2^-, PO_4^{3-}, anionic polymers, etc.).
- Organic chemical Analyses include High-Performance Liquid Chromatography (HPLC), Gas chromatography (FID, NPD) and GC/Mass Selective Detector (MSD), Total Organic Carbon (TOC and nPOC), and Organic halides (AOX, POX, and EOX).
- Particle Size Distribution analysis for samples containing low and high levels of suspended solids.

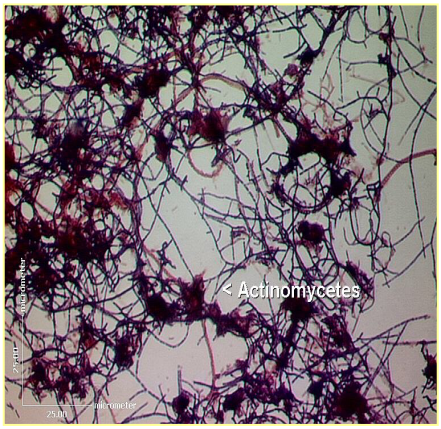
Deposit or Solids Analyses

Deposit analyses are used to characterize composition of solids from diverse sources. Applied instrumental techniques include:

- Wavelength Dispersive-X-ray Fluorescence confirms the presence of elements (Fluorine to Uranium in a range from % to ppm levels, depending on the element and the surrounding matrix.
- SEM-EDXA. Scanning Electron Microscopy – Energy Dispersive X-ray to identify elemental composition of surfaces, layers and small sample quantities.
- Thermo-gravimetrical analyses at different temperatures (typically 105ºC, 550ºC, and 840ºC) to determine primary composition of the deposit (water, inorganic, organic, and carbonates)
- Fourier Transform Infrared (FTIR) analysis is used to identify organic functional groups by major classifications.
- Microbiological examination includes cultivation methods, Bioscan ATP determinations, and microscopic examinations.

Metallurgical Failure Analysis

The Veolia metallurgical laboratory performs failure analysis, corrosion assessment, alloy characterization, surface examination, and coating thickness studies. Via Optical Metallography and Scanning Electron Microscopy (SEM) with Energy Dispersive X-Ray (SEM-EDXA), our experienced scientists investigate at and beneath the surface to determine the root cause of problems, such as microstructural changes, overheating damage, cracking phenomena, intergranular corrosion, micro-chemical variances, micro-hardness variances, composition of deposits, layered deposits, under-deposit concentrations, erosion damage, pitting, etc.



Membrane Autopsy

A membrane element autopsy is performed to identify the root cause of reduced element performance. An autopsy can be performed on spiral wound elements and on hollow fibers. A typical element autopsy includes:

- Foulant analysis: SEM-EDXA, foulant density, LOI-determination, FTIR-spectroscopy, microbiological examination.
- Membrane damage evaluation: Fujiwara testing to detect organically bound chlorine. Autopsy may also involve a dye test to detect physical damage.

Customer Benefits

- The generation of high-quality analytical data to assist in monitoring treatment performance and technical decision-making processes.
- Predict potential fouling or scaling problems related to inlet water quality.
- Enabling RO system operation at maximum water recovery by combining the interpretation of laboratory results and computer-based simulation tools as Argo Analyzer and Winflows.
- A troubleshooting tool to identify the main source of fouling or scaling, thus allowing for corrective action and the selection of the most efficient cleaning regimes.

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Veolia Water Technologies
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