



Water Chemistry and Pretreatment Fouling Prevention

Prevention of Aluminum Fouling

Sources of aluminum fouling are:

- Floccs carry-over from a pretreatment process using aluminum based flocculants
- Post-precipitation of aluminum flocculants due to poor pH control
- Reaction of aluminum with silica, forming aluminum silicates
- Natural mineral silt and colloidal aluminum silicates

Aluminum silicate fouling can be found in the first and last stage of RO/NF plants. Even small aluminum concentrations (like 50 ppb) may result in a performance decline due to several factors:

1. Aluminum reacts with silica. Low silica concentrations (10 mg/L) can result in aluminum silicate fouling. The use of aluminum based products in the pretreatment increases the risk of aluminum fouling significantly. Therefore, the use of aluminum based products is not recommended. Iron based products are recommended instead.
2. The solubility of the aluminum is lowest at pH 6.5. This is the pH at which the flocculation should be run. The RO/NF system should be operated preferably at pH 7 – 9 (dependent on the water analysis since calcium carbonate scaling should be avoided) to keep aluminum in solution.
3. Antiscalants containing polymers (like acrylic acid based products) are sensitive to the presence of metals like iron and aluminum. It is important to select the right antiscalant. Otherwise, the antiscalant is deactivated (poisoned) and subsequently scaling and antiscalant fouling may occur in the membrane. In addition, the antiscalant fouling can act as a nutrient for microorganisms and biofouling will occur.
4. Fine clay/sand particles. It is recommended to remove clay and sand particles in the pretreatment by either multimedia filtration, ultrafiltration or microfiltration. It may be necessary to use coagulants in order to form larger particles that can be removed by the subsequent filtration process.

To minimize aluminum fouling, it is recommended to keep aluminum in the feedwater below 0.05 mg/L.

Excerpt from [FilmTec™ Reverse Osmosis Membranes Technical Manual](#) (Form No. 45-D01504-en), Chapter 2, "Water Chemistry and Pretreatment."

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