

Control of Silica Precipitates

Are you aware of how the presence of excess silica (SiO₂) in water can cause difficult-to-remove scaling on food processing equipment and the surrounding production environment?

Silica is a common impurity in water. Sand, and glass that is made from sand, are primarily comprised of silica. Water picks up silica as it is filtered through sandy soil or as it flows through rivers with sandy bottoms. Water can typically contain from 0-100 mg/l silica. A silica concentration of as low as 10 ppm can cause silica films or precipitates to form on surfaces.

Silica can be present in water in two forms:

1. **Reactive Silica** – soluble form of silica
2. **Colloidal Silica** – very small particles of precipitated silica

The total silica content of water is the sum of reactive and colloidal silica.

Colloidal silica can be removed from water by passing through a 0.45-micron filter. Reactive, or soluble silica, will not be removed by conventional media filters or ion-exchange water softeners. A process water RO, fitted with a 0.45-micron pre-filter, would need to be employed to concentrate the soluble silica. The concentrated silica stream is discarded, and the silica-free/mineral-free permeate stream would be used as purified process water. Process water ROs are typically fed a specialized anti-scalant solution that prevents silica and other water contaminants (calcium, magnesium, iron), from pre-maturely fouling the membrane elements.

In water, reactive silica solubility is both a function of pH and temperature. Silica becomes more soluble as the pH rises above 8.5—this is why alkaline compounds may be fed to a process water RO in conjunction with an anti-scalant.

In the food processing and sanitation realm, silica precipitates, like those shown on the SS pipe to the right, are caused by silica-containing water and/or cleaning solutions that are allowed to evaporate/concentrate and dry on a surface. Once the silica concentrates and precipitates, conventional acids used for sanitation (phosphoric, nitric), will not dissolve the silica residues. The repeated application and evaporation of silica-containing water during the sanitation process will eventually leave behind silica residues on equipment, piping, and floors.



The only way to effectively remove precipitated silica deposits is by application of extremely hazardous ammonium bifluoride or hydrofluoric acid solutions, or by mechanical abrasion/polishing. In cases where the water source contains elevated levels of silica, the best way to prevent silica deposits is by pre-treating the water using a process water RO.

Reach out to the **RITE team** for more information on how to control and prevent silica deposits.

