

# Effective Antiscaling Solutions for Industrial Equipment

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## Introduction

In the realm of water treatment, reverse osmosis (RO) stands as a formidable champion, offering unparalleled purification capabilities. However, even the most advanced RO systems can fall prey to the relentless accumulation of mineral scale, a phenomenon that hampers efficiency and threatens the longevity of the equipment. The battle against scaling has brought to the forefront the indispensable role of antiscaling chemicals—a class of compounds specifically designed to thwart the formation and deposition of scales.

As industries and communities increasingly turn to reverse osmosis for their water purification needs, understanding the critical function of antiscaling chemicals becomes imperative. This article delves into the intricate world of antiscaling agents in the context of RO systems, exploring their mechanisms, applications, and the transformative impact they have on the performance and longevity of these cutting-edge water treatment technologies. From the molecular level to real-world applications, we navigate the waters of scale prevention to unveil the science and practicality behind antiscaling chemicals in the realm of reverse osmosis.

## Chemistry of Antiscalent

**Phosphonates:** These compounds, such as phosphoric acid derivatives, are effective at preventing scale formation by binding with calcium and other metal ions, preventing them from precipitating and forming scale.

**Polymers:** Antiscaling chemicals often contain polymers that can interfere with the crystal growth of scale-forming minerals. These polymers may function as dispersants, keeping particles in suspension and preventing their deposition on surfaces.

**Threshold Inhibitors:** These substances work by raising the saturation point of the water for certain minerals, making it more difficult for them to form scales. Common threshold inhibitors include polyphosphates and certain organic compounds.

**Crystal Modifiers:** Some antiscalants act as crystal modifiers, altering the crystal structure of scale-forming minerals to make them less likely to adhere to surfaces.

**Surfactants:** Surface-active agents or surfactants may be included to improve the wetting and dispersion properties of the antiscalant, ensuring uniform coverage on surfaces.

**Dispersants:** These compounds help disperse small particles or colloids in the water, preventing their aggregation and subsequent scale formation.

**Chelating Agents:** Chelators form stable complexes with metal ions, preventing their participation in scale formation. Common chelating agents include ethylenediaminetetraacetic acid (EDTA) and citric acid.

**pH Adjusting Agents:** Maintaining the proper pH level is crucial for scale inhibition. Antiscalants may contain substances that help control and optimize the pH of the water.

## Calculations

### Qty of Antiscalent (100% conc) in Kgs

= Flow (m<sup>3</sup>/hr) x PPM x Running HR / 1000

### Qty of Antiscalent (Varied% conc) in Kgs

= Flow (m<sup>3</sup>/hr) x PPM x Running HR / 1000

### How LSI plays role in calculating the PPM

The Langelier Saturation Index (LSI) is a measure used to determine the saturation of water with respect to calcium carbonate and predict whether the water is likely to be scale-forming or corrosive. It is calculated using factors such as pH, temperature, alkalinity, calcium hardness, and total dissolved solids.

The LSI equation is given by:

$$LSI = pH + TF + CF + AF - 12.1$$

where:

- TFFT is the temperature factor,
- CFCF is the calcium hardness factor,
- AFAF is the alkalinity factor.

To control scaling, antiscalant chemicals are often added to adjust the LSI to a more favorable range. The specific antiscalant dosage required can depend on the water chemistry and the severity of scaling conditions. The target LSI value varies based on the application, but typically a slightly negative or near-zero LSI indicates that the water is slightly undersaturated and less prone to scale formation.

The concentration of an antiscalant in parts per million (ppm) required to achieve a specific LSI adjustment would depend on the antiscalant's efficacy and the specific water conditions. The exact dosage is often determined through water analysis and testing.

Above +1 of LSI - 3 PPM of antiscalent

Above +1.5 or +2 - 5 PPM or 6 PPM of antiscalent

Above +2.5 - 7-8 PPM

Recommended - 5PPM

### **Water Required for dissolving Required Antiscalant Chemicals**

**Qty of Water =**

Flow of PUMP (LPH) X Working HRS

## **Top Manufacturers of Antiscalant**

**Kemira Oyj:** A global chemical company, Kemira offers a range of water treatment solutions, including antiscalants for RO systems.

**Nalco Water (an Ecolab Company):** Nalco Water, now a part of Ecolab, is a major player in water treatment solutions and provides antiscalants for various industrial applications, including RO systems.

**Avista Technologies:** Avista Technologies specializes in providing specialty chemicals and expert services for water treatment, including antiscalants for membrane systems.

**Solenis:** Solenis is a leading global producer of specialty chemicals, and they offer a variety of products for water treatment, including antiscalants designed for RO systems.

**Genesys International:** Genesys International focuses on water and process treatment solutions, and they are known for producing antiscalant formulations suitable for RO

applications.

**Ajinomoto Fine-Techno Co., Inc.:** This Japanese company is known for producing specialty chemicals, including antiscalants for water treatment systems.

**King Lee Technologies:** King Lee Technologies specializes in providing innovative water treatment solutions, and they offer antiscalants designed for RO and other water purification systems.

**Accepta:** Accepta is a UK-based company that manufactures and supplies a wide range of water treatment chemicals, including antiscalants for membrane systems.

**Italmatch Chemicals:** Italmatch Chemicals is a global specialty chemical group, and they provide antiscalant solutions for water treatment, including RO systems.