



INFORMATION RELEASE

Synergy Technology For Pools, Spas, And Fountains

Functionality and theory of scale inhibition and removal in swimming pools with EasyCare® Scaletec Plus®, Beautec® and Startup-tec®

Water in swimming pools contains alkaline earth metals cations such as magnesium, calcium and barium anions of carbonate, bicarbonate, silicate, sulfate and phosphates. Different combinations of cations and anions will give rise to potentially scale and stain formation on pool surfaces and equipment such as calcium carbonate, calcium silicate, calcium sulfate, barium sulfate, etc. When the combination of these anions and cations are present in concentrations which exceed the solubility of their reaction products, precipitates (scale deposits) form until their product solubility concentrations are no longer exceeded.

Threshold Effect and Scale Inhibition:

Present mechanistic theories postulate that the threshold agents (in Scaletec Plus®, Beautec® and Startup-tec®) are absorbed on the growth sites of the scalant crystallite (scale) during the process of crystallization. This absorption alters the growth pattern so that the resultant scalant (scale) crystals are formed more slowly and are highly distorted.

Crystal Growth Modification:

The process of crystallization is one of ordering, wherein randomly arranged ions in solution take up regular positions in the solid state. The initial stage in the process of crystallization is nucleation. Once formed, the nuclei grow by deposition on the crystalline faces (which begins to form scale). This process may be considered to be a dynamic equilibrium between particles in the fluid phase and those in the solid. Stated differently, the formation of scale is caused by crystalline deposition of selective cations (particularly calcium) and anions (carbonates and silicates) from saturated solutions. These crystalline deposits harden up to a tightly close-packed arrangement due to the formation of symmetrical crystals that fit together tightly by inter-crystal bonding forces.

The threshold inhibitors in EasyCare® brands inhibit the formation of hard scale by preventing the formation of symmetrical crystals. The mechanism of inhibition involves covering the growing face of crystal nuclei by the absorbed organo-phosphonates (from Scaletec Plus® de-scalers) molecule-ions. Thus the mushy and soft scale formed involves modified, distorted and amorphous crystals. The precipitate (scale) never has the chance to form into a tightly closed-packed arrangement where the inter-crystalline bonding forces never are generated to form an orderly hard and dense deposit. The organophosphonate / co-polymer synergy combination in EasyCare® antiscalants have a concentrated charge that is very efficient in distorting the growing crystal matrix. In this case, the solubility of the growing crystal is increased by altering its growth pattern. The modified crystal is thus less adherent, more easily dispersed and dissolved from swimming pool surfaces and buildup on pool tile, equipment, piping, valves, filter and heat exchange surfaces (pool heater).

The synergistic combination of chlorine stable threshold scale and stain inhibitors and dispersants in Scaletec Plus®, Beautec® and Startup-tec® are superior compared to polyacrylate polymers, phosphonic acids and sequestrants (chelates) especially in chlorinated swimming pool environments.

References: Atif Dabdoub, Ph.D., "Chelates in Water Treatment, 12/01/1990; Dublin, Leonard, "The Effect of Organophosphorus Compounds on a Calcium Carbonate Crystal Morphology", 1982; "Water Treatment Polymers", Rohm & Hass Publications CS-564, 1989 and CS-581 1989; Dequest Organophosphorus Compounds, Monsanto Publications No. NT-8602.