Purolite™ Resins Shallow Shell™ SSTC60 Resin for Softening

This Product Information brochure details the advantages of SSTC60 high-performance gel strong acid cation resin for potable and non-potable softening applications.

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Purolite Resins Shallow Shell SSTC60 Resin for Softening

Contents

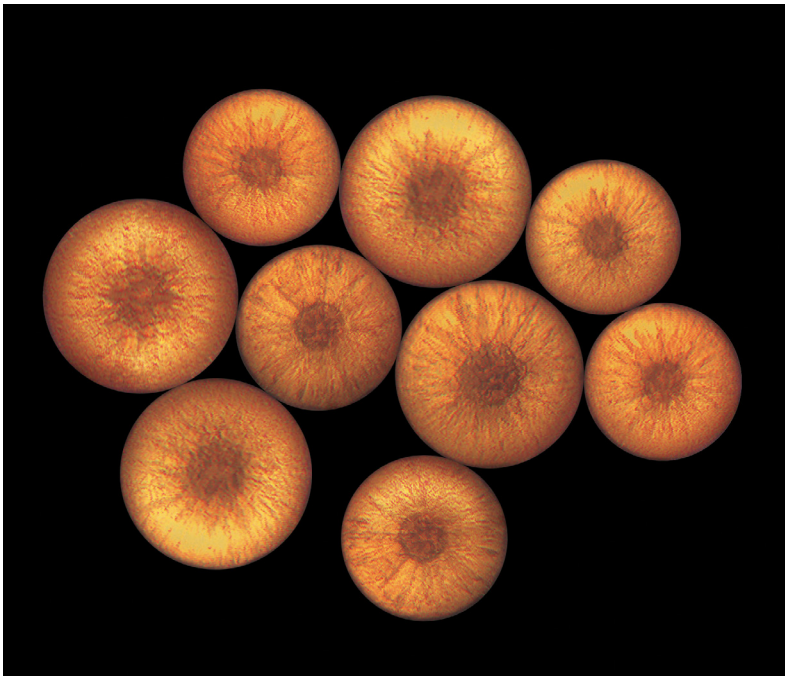
Introduction

Shallow Shell SSTC60 is a very different polystyrenic gel strong acid cation exchange resin used in potable and non-potable water softening applications. It is supplied in the sodium form as Shallow Shell SSTC60 or hydrogen form as Shallow Shell SSTC60H.

Each resin bead in the Purolite Resins Shallow Shell Technology (SST™) family of high-efficiency softening resins has an inert core and uniform depth of functionality. During the manufacturing process, each bead is functionalized (or activated) to the same degree. This means that they have a shorter diffusion path that results in more rapid softening than tradition ion exchange resin. This is particularly advantageous during regeneration since reducing the depth of penetration required to clean the resin allows for a more complete regeneration and provides higher, more efficient utilization of the regenerant. The SST resins have unsurpassed salt efficiency, lower leakage, and reduced rinse water requirements. Compared to conventional softening resins, regenerant reductions of 2–4 lb/ft^3 (32–64 g/L) of resin per regeneration, are possible without sacrificing capacity or increasing leakages. This translates to a salt savings of 700–1,400 lb/ft^3 (318–636 kg) per year based on daily regenerations.

FIGURE 1

SST Resin Beads



Under a microscope, SST resin looks different because each bead has an inert core that resists fouling and enables more thorough regeneration of the bead.

TABLE 1 Typical Physical and Chemical Characteristics

Characteristics	Description/Value
Polymer Structure	Gel polystyrene crosslinked with divinylbenzene
Appearance	Spherical Beads
Functional Group	Sulfonic Acid
Ionic Form	Na^+ form
Dry Weight Capacity (min.)	3.8 eq/kg (Na^+ form)
Moisture Retention	38–46% (Na^+ form)
Particle Size Range	300–1200 µm
< 300 µm (max.)	1%
Uniformity Coefficient (max.)	1.7
Reversible Swelling, $Na^+ \rightarrow H^+$ (max.)	8%
Specific Gravity	1.2
Shipping Weight (approx.)	775–825 g/L (48.4–51.6 lb/ft^3)
Temperature Limit	60 °C (140.0 °F)

Kinetics and Efficiency

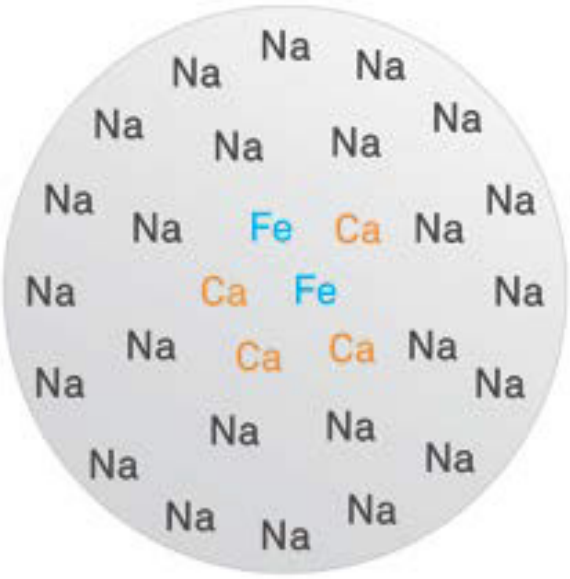
As regenerant is consumed, the force of the reaction diminishes. Because of this, the core of standard resins remains unregenerated at the end of the regeneration cycle. As calcium, magnesium, iron and other elements accumulate, beads becomes fouled, leakage occurs, and excessive amounts of expensive chemical are required. The unique core of SST resin helps solve these problems, making the resin much more efficient by eliminating the sites that take the longest to exchange, are the most difficult to regenerate and are the most susceptible to fouling.

Uniform Depth of Functionality and Diffusion Path

SST resins deliver better throughput with reduced chemical regenerant usage and minimal leakage. Each bead features a uniform depth of functionality so all beads react at the same rate for consistent performance. The Shallow Shell Technology structure shortens the diffusion path and creates more rapid ion exchange. The beads also exhibit superior toughness and durability and resist osmotic shock compared with conventional resin. This not only extends the life of the resin, but is important in industrial applications and portable exchange units where the resin experiences significant physical handling. These resins save water too. The shallow shell technology of Shallow Shell SSTC60 regenerate with about 50% less water and rinse very quickly to quality.

FIGURE 2

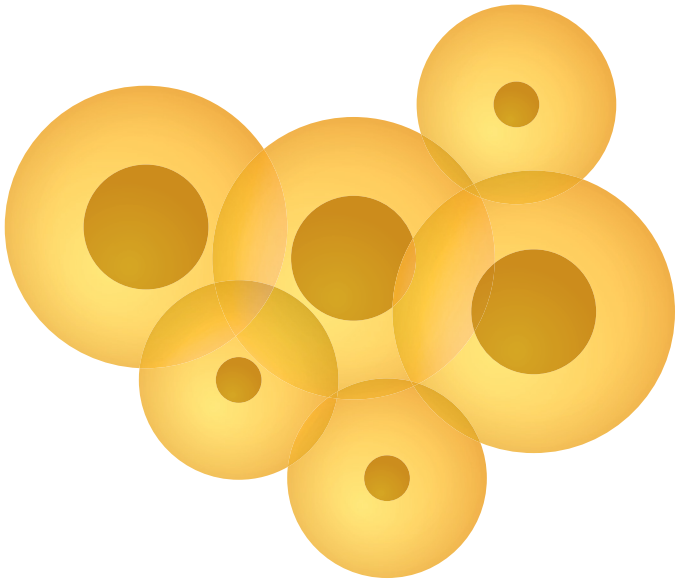
Fouling of Standard Bead



Standard resin beads are susceptible to fouling and leakage as the reaction force decreases as regenerant makes its way through the bead.

FIGURE 3

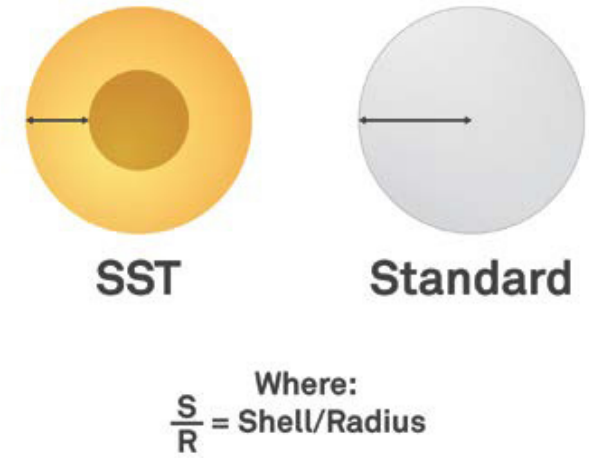
Uniform Depth of Functionality



SST beads feature uniform depth of functionality so every bead reacts at the same rate.

FIGURE 4

Diffusion Path

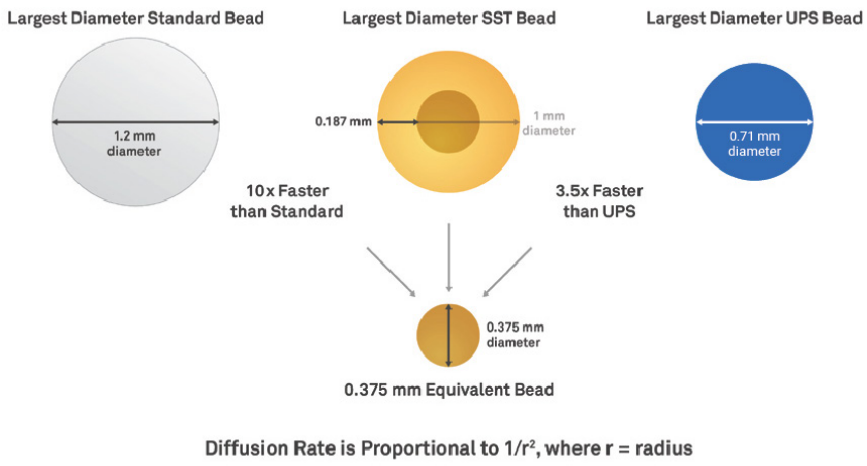


The diffusion path of SST beads is shorter, resulting in faster reactions and more efficient, thorough regeneration.

Shell Radius	0.5	0.6	0.7	0.8	0.9	1.0
Volume Ratio	87.5%	93.6%	97.3%	98.7%	99.9%	100%

FIGURE 5

Diffusion Path Comparison of Different Resin Bead Types



Advantages of SST Resins for Softening

- Higher recovered capacity per pound (or kilogram) of salt
- Better iron removal
- Lower rinse requirements
- No equipment modifications needed; suitable for co-flow, counter-flow and packed bed systems
- Lower leakage at all regenerant levels
- Less susceptible to fouling
- Shorter regeneration cycles
- Excellent physical strength
- Non-solvent sulfonated
- More resistant to oxidation
- Meets NSF/ANSI/CAN 61 requirements for International Standard for Drinking Additives
- Supports ISO 14001 initiatives toward environmental management and impact

TABLE 2 Standard Operating Conditions — Co-Current Water Softening

Operation	Rate	Solution	Minutes	Amount
Service	8–60 BV/h 1.0–7.5 gpm/ft³	Influent Water	Per design	Per design
Backwash	Refer to Fig. 1	Influent Water 5–30 °C (40–80 °F)	5–20	1.5–4 BV 10–20 gal/ft³
Regeneration	2–7 BV/h 0.25–0.9 gpm/ft³	8–20% NaCl	10–30	32–340 g/L 2–15 lb/ft³
Rinse, (Slow)	2–7 BV/h 0.25–0.90 gpm/ft³	Influent Water	12–60	1.5–2 BV 10–15 gal/ft³
Rinse, (Fast)	8–40 BV/h 1.0–5.0 gpm/ft³	Influent Water	6–30	1–5 BV 8–40 gal/ft³
Backwash Expansion	50%–75%			
Design Rising Space	100%			

"Gallons" refers to U.S. Gallons = 3.785 liters

FIGURE 6

Backwash Expansion

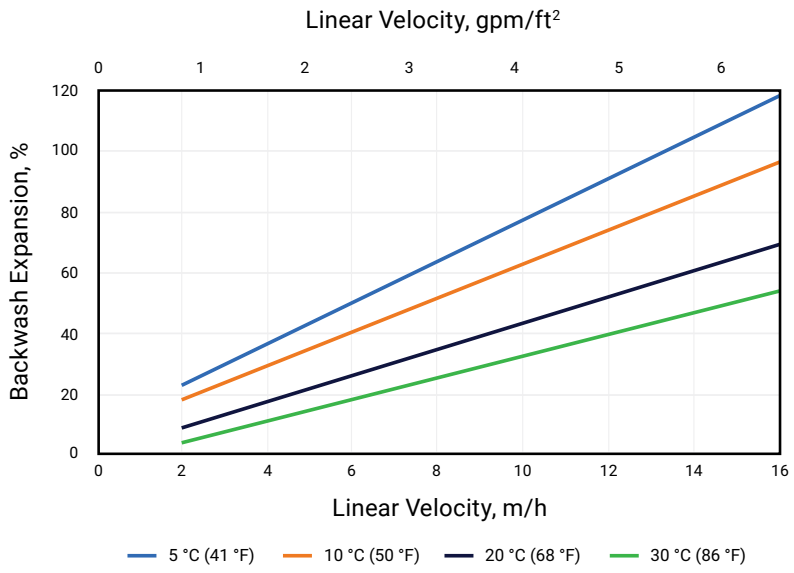
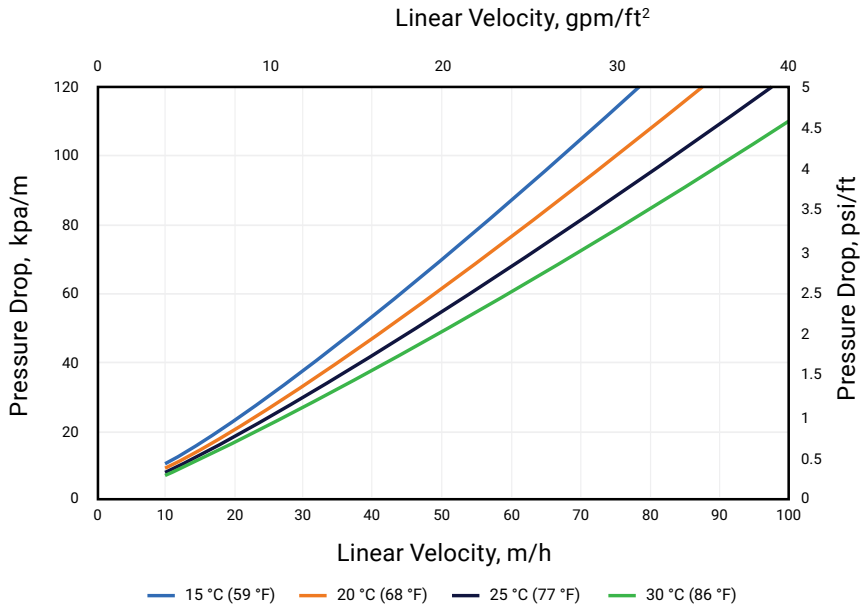


FIGURE 7

Pressure Drop



Capacity

Users are referred to our PRSM™ software for capacity and leakage evaluations. Visit our website at puroliteresins.com.

To view a video showing how Shallow Shell Technology works, go to www.puroliteresins.com/SST.

Ecolab is a global developer, manufacturer, and supplier of Purolite™ Resins including ion exchange, catalyst adsorbent and advanced polymers that make the world cleaner and healthier.

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