Regenerating SST Softening Resins with RO Reject Water

Regulatory restrictions on brine discharge is now commonplace. Therefore finding a way to regenerate ion exchange water softeners without the use of commercial salt is highly desirable. For ion exchange water softeners treating brackish water feed to RO plants, such a solution already exists. By using Purolite® SST shallow shell softening resin and some simple engineering, the reject from the RO can be used as "free regenerant" brine to efficiently regenerate this unique resin while adding no extra salt to the environment.

Purolite® SST resin beads exhibit much higher regeneration efficiency than standard resin, allowing the use of more dilute brine concentrations and lower salt dosages than recommended for standard resins. Central to this higher regeneration level is the unique outer shell and inner core structure of the resin bead. Ion exchange takes place only in the shell area with the core being totally inert. The diffusion path for cations is therefore shorter than that for standard resin, extending from the outer shell to the interface between the shell and core. This means that divalent cations (e.g. calcium, magnesium, barium, strontium) are not exchanged deep in the core of the beads unlike standard resin in which divalent cations migrate deep into the center of the resin beads. The efficiency of removal of these deeply trapped divalent cations essentially determines how well the resin performs during the next service cycle. With SST resin, the time for the brine to diffuse to the shell-core interface is lower, resulting in more highly regenerated beads.

Pilot studies show that brine concentrations as low as 1% can be used to regenerate Purolite® SST80DL. Hardness leakage depends on the system design, with single digit ppm leakage possible and even lower.
An example of a simple softening system design is shown in the figure below. Essentially two softeners operate in alternating mode, with one softener in service mode and the other in regenerating mode. Details on vessel configuration, cycle times and vessel switching mechanism are available from Purolite to qualified OEMs.

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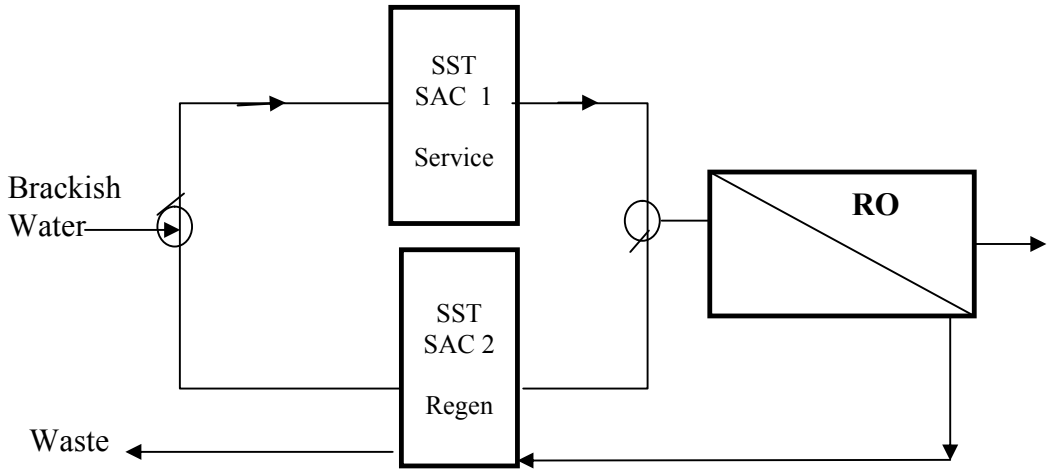

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