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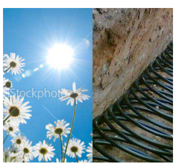
Background information on Water softeners

Water Softeners

Water softeners work using a process called ion exchange, they pass the incoming hard water through a high quality resin column, which removes the hard mineral and exchanges them for soft ones. When the resin becomes exhausted, it is 'regenerated' by drawing a solution of common salt (brine) back through the column. The hard minerals are then released from the resin and flushed down the drain with the excess brine. This 'exchange' process can be repeated as often as necessary. Softeners come in a wide variety of shapes and sizes to cater for every application and flow rate, every softener is individually set according to the local hardness and the amount of salt adjusted accordingly for the regeneration process. It is more efficient to regenerate frequently with a minimal quantity of salt. Water softeners are low maintenance but require regular checks from the user on the level of salt in the brine tank and topping up as necessary.

It is the precise mixture of minerals dissolved in the water, together with the pH and temperature of the water that determines the behaviour of the hardness. A single-number scale does not adequately describe hardness; descriptions of hardness correspond roughly with ranges of mineral concentrations:

Soft:	0–60 mg/L
Moderately hard:	61–120 mg/L
Hard:	121–180 mg/L
Very hard:	≥181 mg/L



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Langelier Saturation Index (LSI)

The Langelier Saturation Index is a calculated number used to predict the calcium carbonate stability of water. It indicates whether the water will precipitate, dissolve, or be in equilibrium with calcium carbonate. In 1936, Wilfred Langelier developed a method for predicting the pH at which water is saturated in calcium carbonate (called pHs). The LSI is expressed as the difference between the actual system pH and the saturation pH:

LSI = pH (measured) - pHs

- For LSI > 0, water is super saturated and tends to precipitate a scale layer of $CaCO^3$.
- For LSI = 0, water is saturated (in equilibrium) with $CaCO^3$. A scale layer of $CaCO^3$ is neither precipitated nor dissolved.
- For LSI < 0, water is under saturated and tends to dissolve solid $CaCO^3$.

If the actual pH of the water is below the calculated saturation pH, the LSI is negative and the water has a very limited scaling potential. If the actual pH exceeds pHs, the LSI is positive, and being supersaturated with $CaCO^3$, the water has a tendency to form scale. At increasing positive index values, the scaling potential increases.

In practice, water with an LSI between -0.5 and +0.5 will not display enhanced mineral dissolving or scale forming properties. Water with an LSI below -0.5 tends to exhibit noticeably increased dissolving abilities while water with an LSI above +0.5 tends to exhibit noticeably increased scale forming properties.

It is also worth noting that the LSI is temperature sensitive. The LSI becomes more positive as the water temperature increases. This has particular implications in situations where well water is used. The temperature of the water when it first exits the well is often significantly lower than the temperature inside the building served by the well or at the laboratory where the LSI measurement is made. This increase in temperature can cause scaling, especially in cases such as hot water heaters. Conversely, systems that reduce water temperature will have less scaling.