HydroClean Service
DESCALE • CONDITION WATER • FILTER • MONITOR

March 26, 2023

Water Softeners:

Complements of: **HydroClean Services LLC.**

Scale is the precipitation of dense adherent material on heat exchanger surfaces. Precipitation of scale-forming constituents occurs when solubilities are exceeded because of high concentrations or increased temperatures. The most common scale-forming constituents are calcium carbonate, magnesium carbonate, and iron. When water has a high concentration of these, it is said to be hard. (Typical tap water will have 70 to 220 ppm hardness, depending on the location.)

Obviously, the best way to prevent scale is to remove all of the hardness from the boiler water. This can be done internally in the boiler or by an external means.

The use of boiler water conditioning chemicals is used to prevent scale in a boiler. The most widely used boiler water chemicals adhere to the calcium and magnesium carbonates, causing them to precipitate out of solution. These particles then fall to the bottom of the boiler in a light floc where they can then be blown down. Obviously, with increased hardness in the make-up water, the quantity of boiler chemicals and frequency of blow downs must be increased.

To remove hardness from the boiler water by an external means, a water softener must be used. The most common form of water softening is the sodium zeolite process. In this process, water passes through a bed of zeolite material which exchanges sodium ions for scale forming calcium and magnesium ions. The treated water has a very low scaling tendency, because nearly all the hardness constituents have been removed (usually below 2 ppm hardness. Some hardness leakage normally does occur. The amount of leakage depends primarily on the raw water hardness, sodium concentration, and softener regeneration level.

Because there is some hardness leakage, a softener should be used in conjunction with a boiler water chemical treatment program.

A common question is, why don't the exchanged sodium ions in the boiler water cause scale in the boiler. like the calcium and magnesium ions. The answer is very simply ---- solubility. Unlike the calcium and magnesium ions, the sodium ions are very soluble and will stay in solution rather than participating as scale. In addition, the solubility of sodium ions is directly proportional to temperature, while the solubility of calcium and magnesium ions is inversely proportional to temperature.