

## Ion Exchange Resins in a Boiler

Occasionally bad things happen, including strainer failures, that result in ion exchange resins leaking from the treatment vessels into the boiler. Ion exchange resins are composed of hydrocarbons with certain mineral constituents, depending on whether they are cationic, anionic, the stage of regeneration, and the minerals with which the resin is partially exhausted.

Most boilers operate at temperatures above 650°F, well above the point at which the resins will become charred. Charring leaves nothing but the carbonaceous backbone of the organic portion of the ion exchange resin beads. When this happens, the following materials will have been leaked into the boiler through decomposition of the resin.

### CATION RESINS

The sulfonate groups will leave the polymer structure as sulfuric and sulfurous acids. Any of the metal ions that the resin had been partially exhausted with or that had coated the resin surface will also be present, i.e. sodium, calcium, magnesium, iron manganese, copper, etc.

### ANION RESINS

The active group of the anion resin is an amine which will decompose to ammonia. Ammonia is a gas and is sometimes fed to boilers for increasing steam pH. The presence of ammonia, therefore will have little negative impact on most systems. However, any of the other salts that the resin had been exhausted with will be present or could become acids, i.e. sulfuric, hydrochloric, carbonic. Any silica that had been removed by the resin will, of course, remain in the boiler as silica.

### HIGHER TEMPERATURE BOILERS

The removal of the charred deposits are important because it sets up galvanic cells that will increase localized corrosion rates, which could result in pitting and boiler failure. Also, these deposits act as insulators and give greatly increased localized temperatures, which also increases corrosion but can lead to even more premature failure due to thermal stresses. Theoretically given enough time, these chars will be oxidized and removed, however, since most boilers have antioxidants added to keep oxygen levels low that is not likely to happen in a reasonable period of time and therefore mechanical cleaning is the recommended course of action.

