



# Boiler Water Treatment

Mario C. Uy

Proper water treatment is essential in preventing problems in your boiler systems - to avoid poor steam quality, to avoid disruption of service, to avoid energy waste, and to avoid liabilities. Below is a short summary of the potential problems commonly found in boiler systems.

## Boiler Tube Pitting

Raw water contains dissolved gasses, among which is oxygen. Left untreated, dissolved oxygen causes pitting in metal surfaces. Pitting results in holes on your tubes which leads to unscheduled shutdowns, disrupting your operation.

Proper water treatment removes the dissolved oxygen, and/or passivates the metal surfaces to withstand against oxygen attack.

## Deposition

Raw water contains minerals. As water evaporates, it leaves the minerals behind. Over time, the minerals supersaturate and precipitate on the heat transfer surfaces.

At best, deposition reduces your heat transfer efficiency. A mere eggshell thickness can increase your energy cost by 10%.

Severe deposition can lead to overheating which in turn can lead to tube rupture, forcing unscheduled shutdowns, and disrupting your operation. Extreme deposition have been known to cause fire.

Proper water treatment removes the mineral hardness; modifies the crystal structures of the minerals; and/or conditions the precipitate to minimize its adhesion on heat transfer surfaces.

## Acid-Induced Corrosion

Raw water contains alkalinity. The heat in the boiler causes the alkalinity to break down to form carbon dioxide which travels with the steam. As steam condenses back to water, it combines with the

carbon dioxide to form carbonic acid. In turn, the acid attacks your steam and condensate systems, i.e., pipes, heat exchangers, traps, tanks, pumps, etc., resulting in unscheduled shutdowns and disruption to your operation.

Proper water treatment reduces the impact of the carbonic acid by neutralizing the acidity, passivating and/or providing a film on the surfaces to withstand against the acid attack.

## Carryover

Raw water contains minerals. As the boiler water evaporates, the minerals build up and the surface tension increases. For example, sea water is more buoyant than fresh water because of its high surface tension due to its high mineral content.

As the surface tension increases, the steam has to work harder to break through the water surface. As it breaks through, it carries some of the boiler water with it, resulting in a poor steam quality that is dirty and wet. This is called a "carryover" condition.

Wet steam is bad because it has less BTU value and it carries minerals which foul the steam system. In boilers where the steam is used for process, poor quality steam will result in poor product quality.

In addition to poor steam quality, the high surface tension can also lead to boiler water surging like a mini wave inside the boiler which can result in priming, hammering, and excessive tripping of the level control. Proper water treatment reduces the potential for carryover, ensuring good quality steam, good product quality, and less maintenance.