



Water Treatment for Brewhouse Steam Boilers



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The Challenges of Water

- Suspended Solids
 - Silt, Other Debris
- Dissolved Solids
 - All the things that are dissolved in water
 - i.e. Calcium, Magnesium, Silica, Bicarbonate
- Dissolved Gasses
 - Oxygen, CO₂



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Suspended Solids

- Not a big problem when the makeup water is coming from a water district. More of an issue for surface or river water sources.
 - Solution is to filter the water down to an acceptable water clarity.
 - Media Filters
 - Calrification / Use of Coagulants



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Dissolved Solids

- Will lead to deposit and scales issues - Loss of heat transfer efficiency.
 - Primary strategy is to soften the makeup water to the boiler. Remove the Ca and Mg.
 - Softeners use ion exchange as a means of removing hardness components.
 - Virtually eliminates the problem - Inexpensive to operate - Relatively inexpensive to purchase.



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- Will lead to corrosion problems throughout the system.
 - Deaerators are used to mechanically strip oxygen out of the makeup water.
 - When operating correctly, a DA will reduce oxygen levels to less than 0.04 ppm.
 - The remainder of the oxygen is tied up with an oxygen scavenger.



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Dissolved Gases

- CO₂ is another dissolved gas that causes problems, This time in the condensate return lines.
- Bicarbonate breaks apart and liberates CO₂ in the boiler.
- It leaves the boiler with the steam, unites with condensate and forms carbonic acid that eventually dissolves what it can on the way back to the boiler.
 - Most often treated with neutralizing amines to buffer the pH back up.



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Cycles of Concentration

- If my makeup water has a conductivity (measure of dissolved solids) of 300 mhos, then why is my boiler water 3000 mhos?
- Steam / Condensate that leaves the boiler is pure water - no dissolved solids - they get left in the boiler.
- Any condensate that doesn't return gets "made up" by raw softened water. That water concentrates or "cycles" up and the conductivity climbs.
- At the set point, blowdown is used to maintain the desired cycles of concentration.



Tips for Best Results

- Use a softener on the raw water supply.
- Have a DA or sparge tube in the feed water tank.
- Automate the conductivity control - skimmers.
- Use motorized ball valves - not solenoid valves.
- Return all the condensate you can.
- Monitor the chemistry - a few simple checks several times per week. Boilers are not “plug and play” devices.



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Case Studies

- Condensate receiver float / pump were broken.
- As a result, all the condensate was routed to the drain.
- Led to a lot of corrosion problems - iron spikes.
- A complete waste of energy - good quality, hot condensate going to drain.



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Case Studies

- Bad check valves between CR and BFW tank and between the Boiler and the BFW.
- Allowed water to back up into the CR tank at night and weekends when the boiler was idle.
- Way too much fresh makeup - 3 yr old BFW tank pitted and failed.
- Moral of this story - use SS spring loaded checks instead of brass swing checks.



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Questions??



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