

## Wave™ Water Treatment Principles

Maintaining proper water chemistry and cleaning scale deposits from chillers and heat exchangers is a never ending chore. The use of the Wave™ Electronic Water Treatment System can significantly simplify normal water system maintenance.

1. **Scale Control** - The Wave™ electronically decomposes a small amount of the bicarbonate in the water forming microscopic calcium carbonate seed crystals and micro-bubbles of carbon dioxide gas. The seed crystals travel throughout the water system protecting it from forming scale.
  - a. **Protects Heat Exchangers and Reduces Energy Requirements** - In areas of high temperature like the chiller or heat exchanger, the seed crystals will grow larger instead of scale forming on the surface. Eventually the crystals will get large enough to for removal by the filter system or they fall to the bottom of the cooling tower basin. Preventing scale in this critical area will result in less energy required to provide heating or cooling. For example, a typical chiller will use 1% more energy for every thousandth of an inch of scale.
  - b. **Softens or Removes Existing Scale Deposits** - On the other hand, areas with existing scale will also benefit due to the micro-bubbles of carbon dioxide gas. As they impinge upon the surface scale, they will create localized areas of low pH that will dissolve small amounts of that scale. The resulting scale is soft and easier to remove. People who use the Wave™ system report that the annual tower cleaning chore is much easier than before.
  - c. **Natural Corrosion Inhibitor** - By allowing a cooling tower to operate above the normal saturation point for calcium carbonate with the Wave™, we make use of the calcium as a natural corrosion inhibitor. Operating the tower at low cycles of concentration below the calcium carbonate saturation point will reduce the corrosion inhibiting advantage.
2. **Enhanced Filtration** - The Wave™ signal can neutralize some of the static surface charge that naturally forms on the surface of small particles floating in the water. This means that the small particles will start to stick together and form larger aggregates that will be easier for the filtration system to remove. This increased effectiveness of filtration will result in very clear, sparkling water.
3. **Bacteria Control** - Another effect of electronic water treatment provided by the Wave™ is that it reduces bacteria populations in cooling tower applications. The Wave™ kills some bacteria outright as they pass the small points of localized high energy created inside the Reaction Chamber. The Wave traps other bacteria in the crystal masses that form due to surface charge reduction. Filtration can remove these bacteria or they become physically isolated from the surrounding water. A residual effect will protect the system several days even if one accidentally turns off the Wave™.
4. **Biofilm Reduction** – If we keep the overall bacteria population floating in the water below the quorum that is required to form or sustain a biofilm, the biofilm will dislodge and disperse. Biofilms are very resistant to normal biocide attack, but the Wave™ is very effective at removing existing biofilms and preventing their return.

### Summary

The use of electronic water treatment systems such as the Wave™ can significantly simplify water treatment. It will enhance filtration, prevent new scale formation, soften existing scale, control bacteria growth and remove existing biofilm. Wave™ treated towers are easier to clean and healthier to be near. For a more detailed discussion of the Wave™ operating principles see the White Paper, “A Reliable Alternative to Chemicals for Cooling Water Treatment”.

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