

Treatment and Management of Cooling Tower Scale

FreshAWL, LLC has developed FreshAWL® Z-AMP™ for scale deconstruction and prevention management. This answer to scale control is offered exclusively through Global Aqua Solutions and provides a margin of safety unachievable with competing products utilizing the existing cooling towers pumps and distribution spray systems.

The cooling towers work efficiently to keep things cool, however, a commonly occurring serious problem arises from the growth of calcareous scale through the cooling process which concentrates natural occurring salts within municipal water. This scale buildup leads to a reduction in cooling efficiency and in some cases can cause equipment shut down.

Water spray in a cooling tower behaves a lot like the mineralized water in a limestone cave, creating scale deposits, but the cooling tower scale forms much faster. Pipes within the cooling tower feed hot water or Freon where it is cooled by an evaporating water spray. This evaporation process leaves behind the minerals thereby creating the scale. The scale will accumulate throughout the life of the cooling tower and continues to cause it to be ineffective or inoperative. It is common for companies to treat the scale with acids or simply pay a high cost to replace it when it fails.

Many different acids have been used in an attempt to clean cooling towers of scale. Acids can only remain in contact with the metal surfaces for five (5) hours or less before they erode and pit the metal surfaces. Dangerous acids commonly used include:

- Hydrochloric Acid
- Sulfuric Acid
- Phosphoric Acid
- Sulfamic Acid

When the tower scale reaches a certain condition due to very hard water and age, the scale ceramicizes. This process turns calcium carbonate, sulfate and silicate into brick hard scale that cannot be removed by acid washing or even hydro-blasting because the ceramic nature of the scale is not easily penetrated. To reach an effective level of penetration, extremely powerful, and dangerous acids must remain in contact with the scale for long periods of time to effectively erode away the scale by dissolving the carbonates. In only a few hours, these acids have the potential to damage or eventually ruin the cooling tower tubes.

Cooling towers that are highly contaminated with ceramicized scale can have thousands, even tens of thousands of pounds of scale adhered to the cooling tower bundle and walls.

The FreshAWL chemical combination is the answer for scale removal without equipment damage:

1. Z-AMP is a blend of penetrating organic acids that change the chemical structure of the scale, softening ceramicized scale causing the outer scale layers to dislodge. Softened scale drops into the collection pan with or without washing at a rate of four (4x) times or more the weight of Z-AMP added to the tower cooling chamber.
2. TKO is a muriatic acid blend that is designed to reduce the corrosive aspects of muriatic acid on metals. When used in conjunction with Z-AMP to maintain a pH in the two (2) range, metal fittings will not pit, and has no affectation at all even after prolonged exposure and multiple applications. Even galvanized systems, which will always have a greater probability of corrosion than brass or stainless, have not shown any new corrosion or pitting during our cleaning protocols.
3. Z-AMP in combination with TKO uses and re-uses the organic acids to eat away at the cooling tower scale without causing damage.
4. This powerful combination can be used as a cleanout bath or continuous maintenance procedure.

The FreshAWL treatment protocol does not recommend using TKO solely for treating the cooling towers. When used alone, TKO could behave like any other mineral acids that will etch and/or pit surfaces. TKO is designed to be used in conjunction with Z-AMP to regenerate the organic acids which neutralizes and dissolves scale without corroding metals.

Therefore, when treating cooling towers with Z-AMP and TKO, the contact time can be extended to 2-3 days instead of 4-5 hours while maintaining the non-corrosive condition. The non-corrosive status and stability is best maintained when the pH is above 2.0, but levels below a 2.0 pH will not normally cause a problem as long as they are limited only to the period of pH adjustment ([see treatment protocol](#)).

The best treatment action of the Z-AMP/TKO combination will occur at a 2.0 pH in cooling tower systems and a 1.0 pH in boiler systems, whereby the highest level of scale will be removed. Z-AMP alone remains active in removing or preventing scale even up to a pH of 8.0. This enables a great maintenance procedure without having to maintain a low pH.

For unusually high concentrations of scale on surfaces, FreshAWL makes a special blend of Z-AMP/TKO Gel which may be sprayed, poured or painted directly onto these contaminated surfaces and allowed to saturate for one hour. This may decrease your chemical requirement to remove high scale amounts especially when the high scaling is in only one specific area, such as bridging or bricks.

Finally, following the clean green nature of FreshAWL products, while being highly effective and safe to use, the Z-AMP/TKO post-treatment wastewater can be disposed of in any sewer drain.