

Evapco Engineering Flash



Passivation

Galvanized steel has a long history as a cost-effective material of construction for evaporative cooling equipment. The initial passivation period during commissioning is a critical time for maximizing the service life of galvanized equipment. Successful passivation **creates a passive, zinc/carbonate layer on the galvanized steel** protecting it from corrosion and early structural failure due to the formation of white rust.

In order to properly passivate evaporative cooling equipment, water chemistry parameters indicated in 'Table 1' must be consistently maintained for the initial 6-12 weeks of wet operation. Since elevated temperatures have a harmful effect on the passivation process, the new galvanized equipment should be run **without load** for as much of the passivation period as possible. Keep in mind other equipment in the system should be compatible with the chemicals added to the system's loop in order to reach the required property levels for passivation.

Property	G-235 Galvanized Steel
pH	7.0 – 8.0
Calcium Hardness (CaCO ₃)	> 50 ppm
Anions of Chlorides	< 250 ppm
Anions of Sulfates	< 250 ppm
Alkalinity as CaCO ₃	< 300 ppm
Chlorine (biocide)	< 0.5 ppm

Table 1: Passivation Water Chemistry

Developing a written, site-specific passivation plan prior to equipment startup helps to ensure the galvanized steel will be properly passivated. This plan should begin with a makeup water analysis and contain information on how critical water chemistry parameters, listed in 'Table 1', will be maintained and monitored. Depending on the water chemistry, chemicals may be required to consistently maintain these parameters. If required, chemicals should be pre-diluted and fed to the system using automated equipment.

Routine visual and photographic inspection of the galvanized surfaces, to include panels as well as coils, should be incorporated into the passivation plan. Successful passivation will turn the bright new galvanized steel to a duller grey layer which indicates that the zinc has been passivated. This zinc/carbonate layer protects the zinc from premature corrosion known as white rust. Identifying white rust early in its formation can ultimately prevent serious damage from occurring.



New galvanized coil



Passivated coil



White rusted coil

White rust is localized, premature corrosion of the zinc that appears as white spots on the galvanized surface. The rapid corrosion can completely remove the zinc in small areas which can leave the underlying steel exposed thereby reducing the service life of the equipment.

Often times, passivation is overlooked in startup procedures for evaporative cooling equipment. Designing and executing a passivation plan upon equipment startup can ensure that the service life of the evaporative cooling equipment is maximized.

For more information on passivation and all other water treatment solutions, please contact your local EVAPCO Sales Representative!

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