

ENERCO CORPORATION

Specialty Chemical Professionals

Passivation Basics

The basic question, which arises, is when does equipment need to be passivated? The answer to this question depends upon the age and condition of the stainless steel in question.

The corrosion resistance of the Chromium-Nickel steels (ANSI 300 series) depends upon the formation of a protective chromium oxide film. This film, however, can be damaged during fabrication, post fabrication, and careless handling. When this film is damaged, the stainless steel surface is susceptible to corrosion and pitting. The “passive” (corrosion resistant) surface needs to be maintained to prolong the life of the stainless steel.

New stainless steel should always be cleaned and passivated to remove the cutting and milling oils and establish a passive oxide layer. A good rule of thumb is to passivate tanks and line circuits once every other year to reduce the probability of corrosion.

Passivation of a stainless steel surface occurs naturally by air, but it is a slow process, so chemicals such as nitric acid are used to accelerate it. To passivate a surface, three basic steps need to be followed:

1. **Degreasing/cleaning:** Neither air nor nitric acid can form a protective film when grease, oil, fingerprints, or other contaminants are present on the surface. To ensure the surface is degreased, a water break test is often employed. Enerco recommends using **Water Based High Pressure Solvent** (on older surfaces you may want to use **Chlorinated Alkaline CIP Cleaner**) at 2-4 oz./gallon and circulating at 140°F for 30 minutes. Follow this with a fresh water rinse. Determine the cleanliness using the water break test.
2. **Passivation:** For all ANSI 300 series Chromium-Nickel stainless steel, a nitric acid solution is the accepted passivation chemical. Enerco recommends using a 25% solution of **Acid CIP Cleaner Phos Nitric** (1 gallon **Acid CIP Cleaner Phos Nitric** per 3 gallons of water) circulate the solution at 130-140°F for 60 minutes.
3. **Rinsing:** Immediate and thorough rinsing with potable water of pH 6-8 is mandatory. Check the pH of the water to be sure that all of the residual acid has been rinsed out of the system. Continue rinsing until a constant pH of 6-8 has been reached and then allow the surface to dry. The stainless steel surface has now been passivated. Depending upon the application, before it can be used in food production, it must be sanitized.

Note: Nitric acid solutions are damaging to most gasket materials, so after Passivation, it is wise to check gaskets for any damage caused by the Passivation process.

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