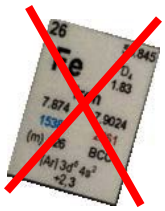
Passivation Oxygen Exposure Time

Are you aware of why it is necessary to allow passivation acid-treated stainless-steel surfaces to be exposed to air (oxygen) for a certain period of time?



Passivation is a process by which type 300 series stainless steel is treated with an acid solution to remove tramp iron contamination from the surface. Left untreated, this tramp iron residue can set up a galvanic cell (battery) with other metals on the surface of the stainless steel when exposed to a conductive solution. In the presence of a conductive solution, electrical current will flow, causing the pitting and corrosion of the stainless-steel surfaces.

304 Stainless Steel is a mixture of Iron, Chromium and Nickel, with trace amounts of other elements, including carbon. 316 Stainless steel is similar to 304 stainless, but it is comprised of different ratios of Chromium and Nickel and has added Molybdenum.

Once the tramp iron is removed from the surface of the stainless steel, the remaining chromium, nickel, and molybdenum (if present) combine with oxygen from the air to form metal-oxides. It is the chromium, nickel, and molybdenum oxides that form the corrosion-resistant, or "passive" layer on the surface of the stainless steel.

These oxides form naturally, over time, and can be removed through chemical attack (by chlorides, hydrochloric acid, sulfuric acid, etc.), or by mechanical abrasion. If the rate of removal of the protective oxide layer exceeds the natural rate of rejuvenation, then pitting and corrosion can occur.

To promote the formation of the passive oxide layer, ASTM Method A967 recommends treating the acid washed and rinsed stainless steel surfaces with a 4-6% heated solution of sodium dichromate. Due to the toxicity of sodium dichromate, and disposal concerns, Hydrite does not employ the application of a sodium dichromate solution in our passivation procedure.

Instead, we rely on the natural formation of the oxide layer using an extended period of exposure to air. The actual amount of time required for air/oxygen exposure is currently unknown. In some cases, the passive layer may form quickly upon exposure to air. In other instances, it develops over time. Hydrite recommends 72 hours to ensure complete drying and exposure of all surfaces and allow for maximum passive layer formation.

Reach out to the RITE team for more information on passivation oxygen exposure time.