

The Technician's Guide to Stainless Steel Passivation

Testing is the only way to verify the passivity of stainless steel, and it is imperative to perform passivity tests at regular intervals and after installing or replacing equipment. Verifying passivation, in addition to validating the effectiveness of passivation bath procedures, will satisfy quality expectations of control engineers and end-users.

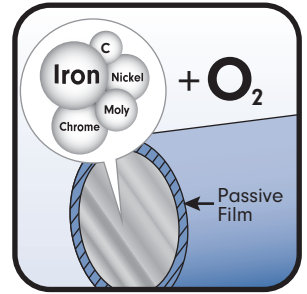
Technicians can use passivation test meters on 300 series, 400 series, 17-4PH and 17-7PH stainless steel. The meter's volt measurement is based on the metal's surface potential under carefully controlled conditions of constant pH. Surface potential is strongly affected by free iron particles, which form a momentary, active corrosion coupling. Measuring the voltage potential across any active corrosion allows for an immediate determination of the metal's passivity.

Following a metal passivation bath, passivation meters can also be used 1) to determine whether a passive film has fully formed on the metal's surface and 2) to establish how long to wait for a chrome oxide layer to fully develop. Stainless steel is typically passive after several hours after the bath, though some alloys and environments will require waiting up to 24 hours. A quick passivity test will determine whether more exposure time is required. By recording test data and time intervals, technicians can use passivation tests to develop and optimize production timelines.

INTRO TO PASSIVATION

Passive Stainless Steel

The ratio of alloyed elements that make stainless steel "stainless". Iron, Nickel, Chromium and Molybdenum. A chemical reaction from these elements with oxygen from the air creates the formation of a very thin "chrome oxide" layer.



How Passivation Is Damaged



Cutting



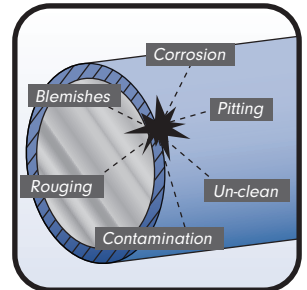
Mechanical Use



Grinding

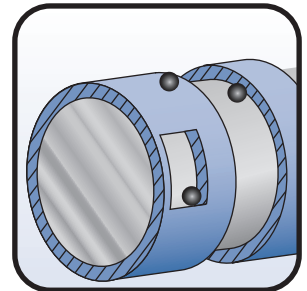


Chemical Contamination



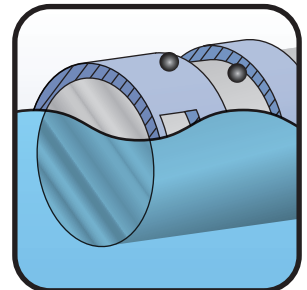
Non-Passive Stainless Steel

- Free iron particles (un-alloyed iron)
 - Damage or a scratch to the passive layer.
- This is also called active because surface can be prone to corrosion.



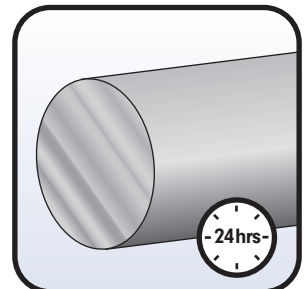
Passivation Bath & Rinse

Stainless steel is washed with an acid solution. Chloride free rinse.



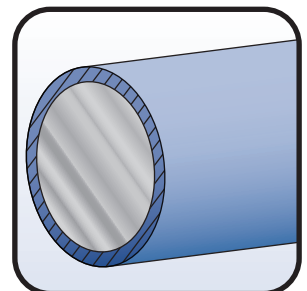
Stripped Down To The Bare Metal

Raw stainless steel after damaged passive film and it's contaminants have been dissolved. Allow 8 to 24 hours for all types of stainless steel to oxidize.



Return to Passive Stainless Steel

The spontaneous formation of a fresh passive film. Stainless steel now ready for corrosion free service. Test to verify.



THE PASSIVATION LIFE CYCLE