

Passivation

Common Names: Passivation, Pickling, Pickle/Passivation

Applicable Specifications: Federal Specification QQ-P-35, ASTM A-967, SAE-AMS QQ-P-35, and AMS 2700

Description: Passivation is the acidic removal of residual iron (or other contaminants) from the surface of stainless steel. Various acids, such as nitric acid, mixed acid, or citric acid are used to accomplish this. Selection of the solution is determined by the specific stainless steel alloy.

Theory says the non-rusting properties of stainless steels are due to a very thin, invisible oxide film that completely covers the surface of the parts and prevents corrosion from taking place. A freshly machined, polished or pickled article will acquire this film rather quickly from contact with the atmosphere. However, such fabricated parts may be contaminated with small particles of foreign matter, which should be removed to impart full stainless properties. An example of this is the slight amount of steel worn off the cutting tools and transferred to the stainless parts during machining. Under certain conditions, a thin coating of rust may appear on the part. This is corrosion of the imbedded tool steel and not the parent metal.

Function & Physical Finish: The primary purpose of a passivation treatment is to remove surface contamination, usually iron, and to oxidize the alloying constituents so that the optimum corrosion resistance of the stainless steel will be maintained. Passivation is *not* a scale removal treatment.

Passivation may slightly dull bright parts, leaving a matte gray surface, dependent upon the specific alloy. It may or may not remove heat treat scale.

There are two related processes: Pickling and Pickle/Passivation. Pickling is dipping or otherwise exposing the part to the acid solution to achieve a clean and reactive surface which promotes natural oxidation by the atmosphere. Pickle/Passivation is the same process, except the part is subjected to the solution for an extended period of time to ensure complete removal of residual iron and thorough oxidation of the alloying constituents. We recommend Pickle/Passivation because it has the advantage that it removes not only the surface iron (e.g. from machining or handling) but also any iron actually within the surface of the metal (as a minor alloying ingredient). The extended exposure time also insures full and uniform oxidation of the surface.

Examples of Use: Automotive trim; food, pharmaceutical, and medical equipment; house wares; hardware; industrial equipment; marine equipment.

Considerations & Limitations:

- Base Material: Stainless Steel.
- Shape of parts: Unlimited except that blind cavities or holes may require supplemental rinsing and/or neutralization to remove the passivation solution.
- Size: Unlimited. Maximum weight: Unlimited. Our 10 ton crane can be supplemented with commercial heavy lift equipment. Systems or equipment larger than can be transported by truck can be passivated at the customer's facility by special arrangement.
- Quantity: Although quantity affects price, quantity is not a limiting factor. Price is determined by how many parts can be process in an hour.
- Thickness of Finish: N/A
- Masking: Can be used to protect critical machined dimensions.
- Heat Treatment: N/A – some heat treat scale may not be removed.
- Method of Processing: Parts can be racked, barrel processed or sprayed.
- Pre-Treatment: Parts must be clean and free from oil, grease and tape residue. Degreasing or other cleaning by others may be required for heavily soiled parts. Normal processing may include caustic soak clean. Sometimes abrasive blasting or mechanical finishing is required to remove heavy scale.
- Post Treatment: None – a protective covers or caps may be required to prevent contamination during transport.
- Packaging: **Parts are repacked as received.** Parts can be shrink-wrapped. This will be done at the customer's request, at extra cost.

Quality Control Process solutions are checked and analyzed following an established schedule and monitored using SPC techniques. Ferroxyl (and similar other methods) testing and certification is available upon request.