

Amer HAMMAMI, Ph. D  
Stainless steel surface treatment technology  
Groupe KEMPLUS, Inc  
6020, Vanden Abeele, St-Laurent Qc, H4S1R9 CANADA  
T : (514) 333-0754 F : (514) 333-5780  
[www.gkemplus.com](http://www.gkemplus.com), [amer@gkemplus.com](mailto:amer@gkemplus.com)



## Introduction

Passivation or passivity represents a state of metals or alloys in which their rate of corrosion is slowed by the presence of a natural passive film, compared to what it would be in the absence of this film. In the case of stainless steel this passive film appears spontaneously by oxidation, because the oxide formed on the surface is insoluble and constitutes an obstacle which slows down the subsequent processes. In an aqueous medium, the formation of this film is related to a range of electrochemical potential as well as to a pH range in which the oxide is stable. As a result, the passive film is formed in the air before the part is put into service

To reach a good passivation we must:

- Remove oils and greases,
- Remove the carbon steel particles that may come from manufacturing or handling operations (tools used to work carbon steel parts, projections of steel particles, etc...)
- Remove the thick oxide layer that may have been formed during heat treatments and / or welding operations.
- Finally the use of chemicals that help form the passive layer: Nitric or citric acid treatment according to ASTM A-380 and ASTM-A967

## Objective

Our goal is to make chemical surface treatment of stainless-steel tanks with eco-friendly chemicals to remove contaminants from the surface and restore the original chromium oxide. The corrosion resistance will correspond to the original resistance of the alloy neither more nor less.

## Procedure for cleaning / passivating of stainless steel

1. **Pickling if needed:** *If the welds are brushed start the passivation procedure at step 4.* Otherwise, apply a thick uniform layer of pickling gel KPNOX18 Gel on

the welding using non-metallic brush for 30-45 minutes (up to 90 min depending on weld).

2. **Rinse** thoroughly with high pressure water
3. Let the surface completely dry.

---

4. **Degreasing:** Spray KP-Clean (*a pH-neutral degreaser*) on the entire surface using a stainless-steel spray gun and let the product stand on the surface for a period of 45 minutes. Quantity required: around 1 liter of -Clean per 1 square meter.
5. **Rinse** thoroughly with high pressure water
6. Let the surface completely dry.
7. Surface cleanness inspection using Black-light and Dyne-Test Pen.
8. If the test indicates presence of oil or grease, repeat step 4 to 7

---

9. **Passivation:** Apply a thick uniform layer of **KPNOX11 GEL** using a non-metallic brush OR spray the surface using a stainless steel spray gun. Quantity required around 1 liter of KPNOX11 Gel per 1 square meter.
10. Let the product stand on the surface for a period of 60 minutes.
11. Rinse the treated surface with high-pressure water jet.
12. Let the surface completely dry.

---

13. **Inspection:** Visual and portable camera 400 x microscope inspection
14. Perform a Ferroxyl test to detect presence of iron residues, using a Ferroxyl test kit (**KPNOXTEST**). If the test indicates presence of contaminant, repeat step 9 to 12. If the Ferroxyl test is negative the surface is completely decontaminated. See TDS for test solution preparation.
15. Clean tested surface immediately with Ethanol 95 % or de-ionized water.
16. The stainless steel surface now complies with the ASTM A-380 and A967 standard and a passivation certificate can be emitted.

Note: Residues and contaminated water must be neutralized to pH6-8. Heavy metals (if any) released in the cleaning of stainless steel must be disposed of, along with residues and neutralized solutions, in facilities authorized to treat hazardous waste in compliance with applicable regulations.