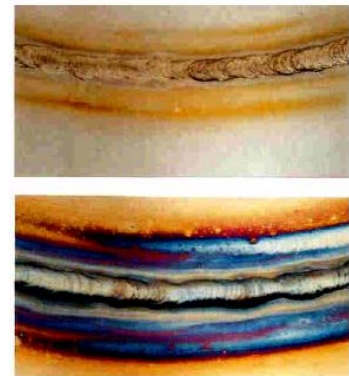


## Why does stainless steel have to be cleaned and pickled after processing?

Stainless steel owes its corrosion-resistant properties to its natural capacity to form a protective oxide layer. After stainless steel has been processed as for example by cutting, sawing, drilling, bending, welding etc, the (extremely thin) oxide layer on the stainless steel has been damaged or is absent in whole or part. When the oxide layer is not restored (by pickling the stainless steel) one might as well use carbon steel. Then at least you know where you are, it is much cheaper and you know that it rusts. Stainless steel rusts too when it is not treated after being processed.

### **Welding**

Welding causes oxidation on and next to the weld seam, both internally and externally. This is visible as a coloured zone and causes a reduction of the resistance to local corrosion. For the interior of for example a pipe the proper backing procedure is necessary during post-treatment after welding. In many instances a post-treatment such as pickling or abrasion is applied after welding to remove the oxidized layer (discolouration) and to improve corrosion resistance.



### **Post-treatment**

The following post-treatment methods are available for removal of the discolouration:

#### Chemical

- immersion pickling
- pickling with pickling paste or spray pickling
- supplementary passivation (after pickling)

#### Mechanical

- abrasive blasting (for example with corund)
- glass pearls
- ceramic pearls
- sanding
- grinding
- brushing

### **Result**

Pickling is the only post-treatment that will restore the corrosion resistance of the weld to what it was prior to welding. This is true irrespective of the type of stainless steel and there is no difference in effectiveness between immersion or application of a pickling paste (Practical recommendation No. LM.94.04 NIL (Dutch Institute for Welding Technology), TNO (Applied Scientific Research)– metal institute).

It is very important that the pickling is properly rinsed (with water) to remove all pickling residues. The final rinse should be conducted with demineralized water.

While all of the methods will result in a clear weld appearance, none of the mechanical post-treatments will provide corrosion resistance suitable for critical applications. Sanding to grit P320 will provide better corrosion resistance than sanding to grit P80, glass pearls or abrasive pearls.



before pickling

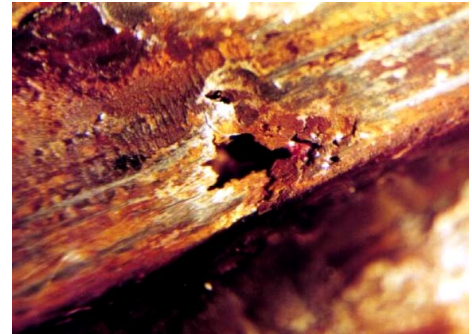


after pickling

Not only is pickling necessary but also cleaning of the stainless steel prior to assembly.

In the photograph below you will see that a hole has formed at the point of accretion of contamination. This leak was caused by failure to clean and pickle the pipe prior to assembly. The pipes lay prior to assembly outside in the mud, cleaning and pickling was apparently unnecessary and the project was in any event completed on time.

In the initial phase the flow speed of the chlorinated mains water through the pipe of  $\pm 1$  metre was quite naturally marginal. All of the water-consuming departments were of course still in the construction phase and the mud residues were easily able to attach themselves to the wall of the huge pipe. The low flow speed of the water allowed the so-called pits to grow as never before. The oxygen required to maintain the oxide layer on the stainless steel was no longer present in the vicinity of these pits. Not surprisingly the first leak appeared within barely one year. No one understood it, stainless steel, expensive material, and not type 304, but 316L quality and now leaking. But not at one spot, you could see water dripping in the initial phase and then going on to spray.



This major company had to suspend manufacturing to replace the corroded stainless steel pipes. The new pipes were however now pickled. Pickling was now seen to be a necessity.

And there are countless examples that may be cited of failure to post-treat stainless steel resulting in leaks at a later stage.

While not all leaks are the direct result of not pickling after processing of stainless steel, the photographs below can unfortunately be attributed to lack of care, not pickling and not cleaning.

Photograph 1 shows that the welder lacked the necessary competence and that probably no one had ever heard of pickling.

Pit corrosion is clearly visible on photograph 2. The cause of this disaster was contaminated mud containing chlorides on a stainless steel pipe at 60°C.



### Pickling and passivation

VECOM has been treating a variety of materials, including stainless steel, for 50 years. Pickling and passivating this material after processing restores the original and essential oxide layer.

We cannot stress the importance of this post-treatment of stainless steel often enough in preventing various types of corrosion of stainless steel.

It has been proved beyond doubt in various scientific reports from, among other publishers, the NIL (Dutch Institute for Welding Technology), TNO (Applied Scientific Research), Avesta, and the Metal Institute that the post-treatment of stainless steel is a 'must'. Despite these reports, folders and other evidence not everybody is yet convinced that pickling in particular is an absolute necessity.

VECOM has seen the results during these many years. Often we are involved in cases of damage where it is already too late.

But we never give up and we hope in this way to be able to spare our customers unnecessary costs.

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