



Electrochemical post-weld cleaning: methods & procedures

When it comes to industrial or architectural applications, stainless steel is the material of choice due to its corrosion resistance. Stainless steel also has high endurance, can be easily fabricated and requires the least effort in maintenance. The industrial environment in which stainless steel is formed or machined is quite hostile and is not very conducive to corrosion resistance. The corrosion usually takes place in the welds. As result of this, pitting and structure failure can take place which could potentially lead to a disaster.

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Since 2010 Stefan Webb has pioneered sales of weld cleaning equipment into Scandinavia. He has been involved in the development of the Cougartron range of electrolytic weld cleaners, and for the past two years has provided sales and training in the treatment of welds in stainless steel.

Electrochemical cleaning

It is thus imperative to treat the surface corrosion of stainless steels. There are a handful of methods for doing this, one of which is electrochemical cleaning. Electrochemical cleaning has a working mechanism that is similar to that of electropolishing. Unlike the electropolishing however, the electrochemical method of cleaning is deemed far more portable, and it can also be applied locally. One would not be wrong in saying that the electrochemical method of cleaning is indeed more advantageous than other methods such as electropolishing, acid cleaning or even mechanical cleaning. When it comes to electrocleaning, you don't have to deal with the annoying problems of dirt, buffing compounds or excessive noise. In addition to that, the appearance of the steel surface is not changed at all: it is simply restored to its original state of being neat and bright. Electrochemical cleaning is an essential step in passivating and enhancing the corrosion resistance of treated surfaces. Electrochemical cleaning is also in a way a very flexible method of cleaning, as it can be carried out on the site during installation. It can also be performed as a remedial treatment.

The electrochemical cleaning process

In a typical electrochemical cleaning process, you can expect to see an electric current being coupled with a mild electrolyte, to cause the

preferential dissolving of surface rust, iron contaminations and various other forms of blots and blemishes. As a result of this, the stainless steel is left surgically clean. The current being used may be either an AC current or a DC current. The performance of the process and its results vary depending on the type of current that you use.

As mentioned before, the electrochemical process causes the steel to be surgically clean. However, it does not scratch, etch or polish the surface in the slightest. Once the cleaning is complete, any non-metallic inclusions are dissolved entirely. These are known to otherwise act as pitting initiation sites. As far as the smoothness of the steel surface is concerned, electrochemical cleaning leads to microscopic smoothness. In addition, electrochemical cleaning ensures that there is no further build-up of contaminants that may facilitate corrosion. With electrochemical cleaning, the overall pitting corrosion of the stainless steel is significantly decreased.

Suitable for welds

Electrochemical cleaning of stainless steel welds is integral to acquiring sufficient corrosion resistance after welding. The heat-affected zones require extra electrochemical cleaning. In most cases, electrochemical cleaning is performed using portable electrochemical cleaning equipment. Studies suggest that the electrochemical cleaning method, when applied to a weld, can restore and even improve the corrosion resistance of the weld.

Lack of information about post-weld treatment

Working with leading fabricators that supply the offshore sector, it is remarkable that there is not more



Cougartron Propuls machines use unique patented electronics based on pulse to clean up to 60 m of welds per hour.

research and documentation done on post-weld treatment. There are numerous welding procedures, but little documentation on how to effectively clean the weld seam afterwards.

Duplex requires post-weld treatment like any other stainless steel and there are a number of ways this can be done. However there appears to be little clarity as to what is good practice. ASTM A 380 and 967 are the most commonly used standards and are acknowledged to be the benchmark.

Post weld cleaning can be done by mechanical abrasion or a chemical treatment also known as pickling. Mechanical abrasion means grinding or brushing and often makes the surface vulnerable to contamination.



Failure to clean and passivate the weld can have a serious impact on the lifecycle of the weld - such as corrosion, pitting, crevice corrosion and fatigue.

Experience tells us that the most effective way to remove the chromium depleted layer is by chemical treatment. Traditional pickling is time consuming and requires expertise and careful handling as it is highly toxic.

An alternative chemical treatment can be done electrolytically. This process means using mild acids and accelerating aggressiveness by putting a current through them thereby adding heat. Electrolytic weld cleaning not only offers improved HSE - it also passivates immediately and improves the surface finish. Research performed by Dr. Ian Ward from Sandvik Materials Technology, Australia proved that electrolytic weld cleaning achieves higher corrosion resistance than other methods. Now that the latest technology makes it possible to clean up to 60 metres of weld seam per hour, why would you want to use any other method?

Conclusion

In conclusion I am sure that more documentation and procedures about post-weld treatment needs to be done in order to modernise and increase the reliability of stainless steel structures.