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“Contributing to our stainless steel manufacturing customers’ success by helping them work better”

STAINLESS STEEL PASSIVATION

Monitoring the state of corrosion protection?

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Real World challenge:

It is not uncommon to hear end-users complain about the appearance of rust shortly after installation and commissioning of a part. On-site repairs and refurbishment is costly for the fabricator and the need has risen for a clear diagnostics tool capable of monitoring the state of the passivation before it leaves the shop.

Often, microscopic corrosion cells are present on the surface of the delivered workpiece but cannot be located and detected visually prior to shipment. These later spread and become visible creating a phenomenon known as pitting. That is why it is important for a fabricator to ensure his work is properly passivated before it is put in service.

The corrosion resistance of stainless steel is significantly reduced near welds as a result of the heating cycle. Visually, this can be seen as a darkened zone next to the weld. When electro-chemical cleaning or pickling is performed on the weld corrosion risk is reduced but the treated zone still have to be passivated for 24-48 hours before the corrosion protection is fully restored.



Discoloured heat affected zone on a stainless steel weld. Corrosion protection is severely reduced in this zone.

Passivation is an unavoidable process whenever mechanical treatment or welding is done on a stainless steel part. Corrosion repair and part wasting is costly so a clear method of evaluating the quality of passivation is needed and has been demanded by the industry in the recent years. As technology development (bio-medical, semiconductor, aerospace) demands better stainless steel, steel that can withstand passage or contact of highly aggressive fluids and gases, metal fabricators are awaiting a techniques that could help them avoid costly repair or make sure the workpiece will withstand long periods of use between maintenances.

Walter’s solution is an electro-chemical test probe (PN: **54T010**) based on a technology called Open Circuit Potential that provides the user with a numeric value of the state of the passivation process.

Technical background:

Stainless steel gets his amazing corrosion protection properties from the presence of Chromium in the alloy (around 11%). The Chromium present reacts with oxygen to form a thin Chromium oxide layer at the surface of the workpiece thus preventing the reaction of Iron with oxygen which forms the well known iron oxide: rust. The thin chromium oxide layer thus acts as a barrier between the Iron rich bulk alloy and the oxygen rich ambient air.

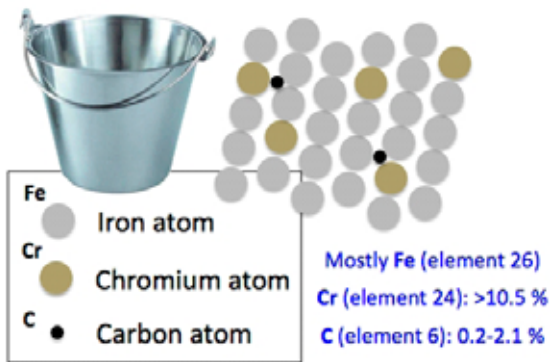
The corrosion resistance of stainless steel is dependant on the thickness and chromium content of that thin surface layer. Once the surface chromium as almost all reacted with oxygen (normally 24-48 hrs is necessary), forming a thick enough layer, the surface is said to be passivated or passive. The passivation quality can be affected by surface contamination or chloride attacks. It is thus necessary to ensure that the works are properly passivated before they leave the shop since exterior attacks are more prone to occur during transport or at the end-user.

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Walter's device instantly delivers a numeric reading that is directly linked to the thickness and composition of the protective oxide layer.

Stainless Steel: Add Chromium



Chromium oxide blocks corrosion



Composition of stainless steel and protective effect of the Chromium oxide layer present at the surface



Walter's 54T010 Passivation Testing device.

For a fabricator, stating that the workpiece has a minimal passive value on delivery not only gives assurance to the end-user that he is dealing with a professional but also makes eventual claims concerning corrosion easier to deal with. He can also inform his customers that in an effort to always provide the best products, he has implemented passivation control in his quality assurance policy.

Store your data!

With our new generation of passivation testers, you can now store your data. More and more, for quality purposes, it will become key to record and store all the information related to your stainless steel production and transformation processes.

With our data entry software with USB port, Walter surface technologies can now help you achieve this objective. Over time, this enable you to monitor the quality of your work and make sure it always meet your customer's standards.

About WALTER:

Walter Surface Technologies has been a leader in the surface treatment technologies for more than 50 years, and has been providing high productivity abrasives, power tools, tooling, chemical tools and environmental solutions for the metal working industry. Founded in Montreal, in 1952, Walter Surface Technologies is now established in 7 countries in North America, South America and Europe. For additional information: www.walter.com

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