

Spot-Weld Corrosion Resistance vs. Sensitization

Murray is the only US manufacturer that uses spot welding to attach the housing to the band. Over many years our competition has tried to portray this as a negative feature making claim that welding causes a lower corrosion resistance material. This bulletin will provide the technical aspects regarding spot welding and corrosion resistance.

In the realm of arc-welding and fabrications that use heavy wall stainless steel pipe and plate where the material during welding will be in the 800 to 1250 (F) temperature range for an extended period of time, there is a condition created that is called "sensitization". This is a time-temperature transformation of the alloy structure wherein Chromium is pulled out of solid solution and becomes tied up with the element Carbon. The Carbides of Chrome formed in this reaction tend to accumulate (precipitate) at the grain boundaries of the material.

These carbides have lower corrosion resistance than the surrounding material and in corrosive environments they can lead to a condition known as Stress Corrosion Cracking, which is a corrosive attack of this boundary layer. One industrial practice to combat this condition is to fully anneal the welded areas which dissolves the carbides and places the chromium back into solid solution. Full corrosion resistance of the material is hence restored.

In material testing labs across the country, where they want to intentionally "sensitize" stainless steel, they will hold a stainless material sample in the 800 — 1250(F) temperature range for 1— 2 hours followed by a slow air cool. This generates the carbide precipitation at the grain boundaries as described above. The "sensitized" materials are useful in comparing different grades of stainless steel to different environmental (corrosive) conditions. Of great significance here is the amount of time required for this transformation to take place. High temperature must be applied for a long period of time (hours).

In comparison, when Murray spot-welds a housing to a band there are four (4) spot welds completed in a total of about 0.8 seconds or 0.2 seconds per weld including the physical index time. The spot-weld time interval is so short that the stainless does not have adequate time to start making the transformation. Metallographic studies and salt-spray testing have never revealed any "sensitization" or short coming in the corrosion resistance of our spot-welded stainless steel assemblies