

Stress Corrosion Cracking of Austenitic Stainless Steel

In many industries, including: food, beverage, and pharmaceutical manufacturing, the use of stainless steel tubing is employed for all process lines. Stainless steel is chosen for its superior cleanliness and ability to resist rust and corrosion. However, it is important to note that stainless steel can still corrode in the presence of chlorine. The mechanism in which stainless steel corrodes is known as stress corrosion cracking.

Stress corrosion cracking (SCC) is only applicable to the Austenitic group of steels and is directly related to the nickel content. The main factors contributing to SCC are chlorides, tensile stress, and process temperature, with the critical temperature to initiate corrosion at 50°F. In tubing and piping scenarios, tensile stress is introduced into the system by welding, machining, grinding, and cold working. The only way to help alleviate this stress is to anneal or shot-peen the final assembly which is not possible when installing tube or pipe. To make things worse, most processes in these particular applications are running at elevated temperatures in excess of 250°F. At this temperature and residual stress level due to welding, the potential for corrosion cracking increases significantly. When SCC does occur, the surface can remain unharmed while fine cracks penetrate deeply into the material. Stress corrosion cracking is classed as a catastrophic form of corrosion - a disastrous failure can occur unexpectedly even when there has been minimal material loss of the stainless steel.

It is very important to choose an insulation material with minimal chlorides to ensure that corrosion does not occur. The industry standard for non-corroding pipe insulation is 350 ppm according to ASTM C871-04. Techlite® insulation contains only 95 ppm making it the clear choice when insulating stainless steel assemblies. For this reason, Techlite® has been chosen by many manufacturers of clean rooms, drugs, food and beverages, and even has nuclear regulatory approval for use on stainless steel lines. Whatever the industry, the solution flowing through the process lines is the lifeblood of the company and preserving the product is vital to the company's success.