CVGRailings SPIGOT CORROSION DATA

The United States and Canada are known to experience salt-laden mist originating from the oceans. The rainwater in these regions also has chloride concentrations, and people use deicing salts in the mountainous or northern regions within the U.S. All these scenarios lead to surroundings that are harsh to steel elements. As such, there's significant application corrosion experienced in these regions.

The best way to minimize the effects of such harsh conditions and limit corrosion is by using CVGRailings 316 Stainless Steel Spigots.

How Stainless Steel Beats Corrosion

You are already familiar with the effect of Chromium in reducing corrosion in stainless steel offshore applications. The thin passive layer that covers the surface is usually tenacious. This means that even if you remove it by machining or scratching, it will still form again. The extra nickel in 304 helps by broadening the passivity range. Grade 316 stands out as the most robust since it contains at least 2% of molybdenum, a further addition that magnifies the passivity range. Although molybdenum is found in some other grades of stainless steel, it is the relatively high concentration present in 316 that helps to prevent the saltwater causing pitting or crevice corrosion.

Stainless steel should not rust if it has been well maintained. However, it is still likely to corrode when exposed to several conditions. The process will be different from the rusting experienced by carbon steel. The most common form of corrosion displayed by stainless steel is pitting, which occurs when the surrounding conditions overwhelm the passive film. The process is evident in small, dark-brown pits spread on the metal surface. However, it doesn't interfere with the steel's mechanical properties.

Stainless steel also experiences crevice corrosion resulting from deposits that create crevices on metal surfaces. It's almost similar to pitting but covers a larger surface area. While it may not affect the steel's mechanical processes, crevices are not attractive. You can minimize this type of seawater corrosion by creating designs without sharp corners and covering areas prone to cracking or pitting.

Causes of Corrosion on Stainless Steel in Marine Environments

No stainless steel is completely resistant to corrosion and the effectiveness varies with various factors including:

- Grade of stainless steel used
- Service temperature
- The concentration of salt in the seawater
- Water flow rates & oxygen levels of the water
- Amount of time in contact with saltwater
- Cleaning and maintenance frequency

Corrosion can occur in stages and increased chromium content in stainless steel can slow the process of corrosion down. The chromium on the surface of this steel creates a type of coating that protects the material from corrosion, when it is exposed to oxygen. This coating is what may appear as “rust” but is really working to slow corrosion on the material. Corrosion of a material can occur through the following devices:

- Biofilms
- Chemicals
- Galvanic Corrosion
- Stress Corrosion Cracking
- Intergranular Corrosion

These are all types of corrosion that can occur with stainless steel, whether it be a combination of smaller amounts of tensile stress, temperature and sea water (stress corrosion cracking) or just a passive layer on the stainless steel being attacked by a chemical reaction such as sulphuric acid.

There are of course more suitable special metal alloys for fully submerged applications, but austenitic stainless steels can be a great option for applications near saltwater or splash zones due to their high strength, lower cost, great formability and very good corrosion resistance.

Treatments for Corrosion

Minor and moderate corrosion can be treated using an all-purpose lubricant or phosphoric acid-based stainless steel cleaner.

Minor corrosion

- Use an all-purpose lubricant, such as WD-40, to wipe affected area.
- Rinse thoroughly with clean water.

Moderate corrosion

- Use a phosphoric acid-based stainless steel cleaner such as E-NOX CLEAN.
- Spread the cleaner evenly, leave on for 30–60 minutes, then neutralize the acid with a spray-on alkaline cleaner such as UNO S F.
- Wipe the surface clean with a paper towel.
- Rinse thoroughly with clean water.

Passivation Procedure

A clean stainless steel surface can be re-damaged through mechanical means, extreme heat, or chemical damage. When this happens, iron is exposed, and the material is once again subject to rusting. Passivation may need to be performed on a regular basis to prevent rust. Passivation maximizes the inherent corrosion resistance of a stainless alloy.

Ideally, the passive layer will develop immediately after machining or passivation to completely cover the stainless steel surface. In reality, particles and contaminants are likely to adhere to the surface. If they are allowed to remain, these foreign particles reduce the effectiveness of the original protective film. Passivation is needed to maximize the natural corrosion resistance of stainless steel and remove surface contamination.