CORROSION RESISTANCE

General Corrosion
Titanium alloys have excellent resistance to corrosion in a wide variety of environments including seawater, salt brines, inorganic salts, bleaches, wet chlorine, alkaline solutions, oxidizing acids, and organic acids. Titanium is incompatible with fluorides, strong reducing acids, very strong caustic solutions, and anhydrous chlorine. Due to its combustibility, titanium is not suitable for pure oxygen service. Titanium does not release any toxic ions into aqueous solutions, thus helping to prevent pollution.

Crevice Corrosion
Titanium alloys have excellent resistance to crevice corrosion in salt solutions and generally outperforms stainless steels. Unalloyed titanium (grades 1, 2, 3, and 4) typically do not suffer crevice corrosion at temperatures below 80°C (175°F) at any pH.

Palladium alloyed CP titanium (grades 7, 11, 16 and 17) are more resistant and typically do not suffer crevice corrosion at temperatures below 250°C (480°F) at pH greater than 1.

Microbiologically Influenced Corrosion (MIC)
Titanium alloys appear to be immune to MIC. They do suffer biofouling, but this can be controlled by chlorination (which does not impair titanium).

Galvanic Corrosion
Although it is a reactive metal, due to the extreme stability of the passive film which forms on its surface, titanium typically exhibits noble behavior. Thus it functions as the cathode when coupled with other metals. Titanium is not affected by galvanic corrosion, but can accelerate corrosion of other metals.

Stress Corrosion Cracking
Titanium alloys have excellent resistance to stress corrosion cracking in hot chloride salt solutions.

Erosion Corrosion
Titanium alloys exhibit excellent resistance to flow-induced and erosion corrosion at velocities to above 40 m/sec.

Hydrogen Embrittlement
Titanium alloys are susceptible to hydrogen embrittlement under some circumstances. This is generally less of a problem for the low- strength grade 1 and grade 2 titanium alloys than for higher strength titanium alloys. Absorption of hydrogen by titanium normally occurs when the temperature is above 80°C (175°F), and the titanium is galvanically coupled to an active metal or an impressed current or the pH is less than 3 or greater than 12.