



GALVANIC CORROSION

A NOTE FROM OUR METALLURGIST

Galvanic corrosion occurs when two dissimilar metals are in contact in the presence of an electrolyte. The difference in electro potential of the metals results in a galvanic reaction similar to that in a battery.

When galvanic corrosion occurs, ions flow from the less noble alloy, the anode, to the more noble alloy or cathode. In order for this flow of ions to occur, an electrolyte must be present. Galvanic corrosion cannot occur without the presence of an electrolyte and electrical contact between the metals. The production fluid or packer fluid may serve as the electrolyte. However the conductivity of produced fluids and oil based packer fluids are low and generally not a concern. Water based packer fluids and acidizing fluids are more of a concern because they are stronger electrolytes.

The greater the difference in electro potential of the metals, the greater the driving force for accelerated corrosion of the anode. However the difference in electro potential is not strictly alloy dependent. The environment, surface condition and presence of surface films also play a role. Scale and surface films from corrosion inhibitors can act as an electrical insulator and prevent galvanic corrosion. Nickel base CRAs and stainless steels in oxidizing environments have a passive surface film. If both alloys are passive then galvanic corrosion is unlikely. However under reducing conditions such as acidizing, one or both alloys may become active and accelerated galvanic corrosion will occur. The rate of galvanic corrosion is also dependent upon the ratio between the surface area of the cathode and the anode. The higher that ratio, the higher the corrosion rate at the anode.

Because dissimilar metals are often in contact in oil and gas production equipment, galvanic corrosion is a valid concern. Examples of this include mixed tubing strings, CRA tubing or liners in contact with steel casing, nickel alloy accessories in conjunction with stainless tube, etc.

**While every effort has been made to ensure the accuracy of the above review, assessment, conclusions, and report, the appropriateness of their application and their interpretation remain the sole responsibility of the user.*