Cause and Prevention of

Galvanic Corrosion in Aluminum

Cause

Four conditions must be present for galvanic corrosion to occur:

- **Cathode** - the more noble or least active metal. This metal has current discharge properties and will be protected from corrosion by the presence of the anode metal. Cathode examples: copper, gold, silver, nickel
- **Anode** - the least noble or active metal. This metal has current acceptance properties and will corrode. Anode examples: magnesium, zinc, aluminum
- **Electrolyte** - the capacity to conduct electrical current through the flow of ions. Electrolyte example: water
- **Metallic path** - metallic connection conducting electrical current.

Other factors affecting the corrosiveness of water are pH, temperature, and oxygen content. Water pH should remain between 6 and 8 to minimize corrosion. Increased temperature and oxygen in water also accelerate corrosion.

Prevention

Five ways to inhibit galvanic corrosion in water systems:

- **Cathodic Protection** - A sacrificial anode (usually a zinc or magnesium rod) is installed in the system. The material is more anodic in nature than the aluminum and draws the corrosion away from the aluminum. This is a higher maintenance solution as the anode must be replaced periodically.
- **Water Condition** - Change the water treatment system. Eliminate any chlorine or floating ions and monitor the pH level of the water. Add corrosion inhibitors.
- **Material Selection** - Change the ratio of dissimilar metals so it is more evenly balanced, or remove the dissimilar metals completely. Use stainless steel components.
- **Coatings** - Insulate the metals with a protective coating. This is often temporary. The anodizing on our aluminum manifolds usually provides adequate protection, except in severe environments.
- **Metal Isolation** - Install an insulative fitting, such as a PVC bushing or pipe connection to break the electrical connection of the metallic path.

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