Corrosion is always on the prowl, ready to take down your equipment, fixed and otherwise. Don't let this predator catch you off guard.

Metallic corrosion is a naturally occurring process that takes place at varying rates depending on the specific combination of alloy and application conditions unless there is intentional intervention to modify the situation. Corrosion is an inherent force like gravity. The laws of thermodynamics dictate that corrosion will occur in many situations. Principles of electrochemical kinetics define the rates at which those possible processes occur, this is primarily true for fixed equipment, corrosive attack also can cause or contribute to failures in rotating equipment.

Rational decision-making regarding corrosion control is best done when the total life-cycle cost of each alternative is clearly defined. Often, the values of future costs and their timing depend on best-available estimates. Then, the financial techniques of discounted cash flow analysis should be applied.

The three primary areas of corrosion control are:

1. Material Selection
2. Coatings
3. Chemical Inhibitors

Clearly, there are many ways to address the problem of in-service equipment failures. When it comes to corrosion- control methods, there are numerous options to review. Awareness of the major alternatives is an important first step.

Material Selection

The control method here is based on the inherent levels of corrosion resistance of the candidate alloys in the given environmental conditions.

To make the materials choice, the decision maker must attempt to know - to the greatest extent possible - the general chemical make-up and/or the concentration of the corrosive medium, as well as other variables important to corrosion. The latter may include the presence and concentrations of trace elements in the general medium, the maximum operating temperature, the flow

velocities, the level of both applied and unavoidable residual stresses and whether the applied stresses are static or cyclic. The possibilities of “worse case” variations in operating conditions due to process upsets and start-up and shutdown periods must also be considered. Other factors include how long the selected material must provide useful service and whether periodic preventative maintenance monitoring can or will be done over time.

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Coatings

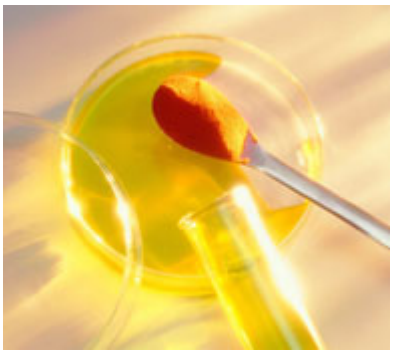
Most coatings but not all function primarily by providing a barrier between the corrosive medium and the substrate metal below. This category of corrosion control is the most widely used.

There are several different types of coatings, e.g., organic and inorganic paints and primers, galvanized coatings on steel and anodization on aluminum alloys. The many varieties of paints and primers get the most widespread use.

Generally, a good system will consist of clear specifications, excellent preparation of the substrate surface, application of a primer, application of a top coat and competent field inspection at all stages of the process. It is widely agreed that surface preparation is by far the most important factor in achieving success.

It is always wise to spend more and achieve an excellent job of surface preparation, even if the top coat selected may be compromised. A well-prepared substrate is most important because it provides a base for good adhesion of either the primer (if one is used) or the top coat. Adhesion of the coating is critical.

Chemical Inhibitors



Corrosion inhibitors are organic or inorganic chemicals that are added in small quantities to a corrosive medium so that the rate of corrosion of exposed metal is significantly reduced. There are many types and they function by several mechanisms. While inhibitors are commonly used in cooling water systems and in boiler feed water to steam boilers, they also are used with acid solutions. Vapor phase inhibitors often are included inside shipping containers for equipment to prevent

atmospheric rust during prolonged shipment and storage periods.

Many inhibitors function in liquid systems by precipitating out of solution and forming an insoluble, micro scale barrier film on the metal surfaces being protected. Thus, they act by retarding the anodic, the cathodic or (most effectively) both of these corrosion reactions on the metal. Examples of this type are certain alcohols, amines, sulfur compounds and phosphates.

Inhibitors known as oxygen scavengers react with residual oxygen in boiler feed water (after mechanical oxygen separation has been applied) to negate oxygen pitting of steel boiler components.

Other corrosion-control actions

In certain situations one or more of the following approaches can have merit:

In rotating equipment, pay special attention to factors related to failure by fatigue, e.g., sharp radii, poor surface finish and castings defects. Depending on the given material and conditions, most real world fatigue has at least some corrosion involved. “Pure” mechanical fatigue only occurs in a near vacuum environment.

Conclusion

Corrosion in its several forms is the cause of much lost revenue due to failures of equipment in many industrial applications. There are many facets to corrosion control and knowledge in several areas is required to effectively fight this predator. It is always advisable to obtain objective, competent advice when seeking the optimal choice among available corrosion-control alternatives.

For understanding what valve metallurgy is best suited for your environment,

please contact your nearest KHIMJI FLOW EQUIPMENTS OFFICE for complete technical specifications.