ScavSol

Closed Water System Cleaning & Protection Using ScavSol Functionalised Solid Metal Scavenger System

Iron/Steel Corrosion Basics

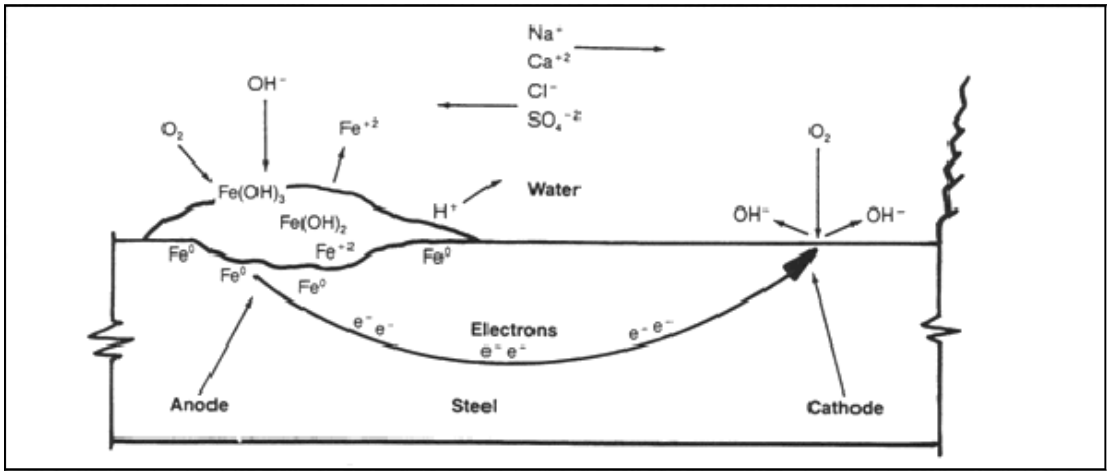

Figure 1 – The iron corrosion cell

Anyone who has ever studied water treatment will be familiar with this diagram. The important point to note here is that the metallic iron passes through a soluble form – often seen by water treatment chemists as evidence of active corrosion when detected in cooling water – before being further oxidised to form the insoluble oxides, such as haematite, magnetite or gamma iron oxide.

This process is shown in figure 2 below. The insoluble iron oxide forms deposits, which can then lead to under-deposit or pitting corrosion. This leads to the generation of even more soluble iron, and a vicious cycle is established.

Whereas controlled generalized corrosion may take many decades to produce even minor operating problems, aggressive and localized corrosion, such as under deposit and MIC, can accelerate the need for pipe replacement to as little as a few years - sometimes with little noticeable indication that such a problem exists. A pitting condition is often suggested by measured corrosion rates exceeding 5 MPY, or a highest to lowest wall thickness variation of over 0.050 in., and should be addressed immediately.

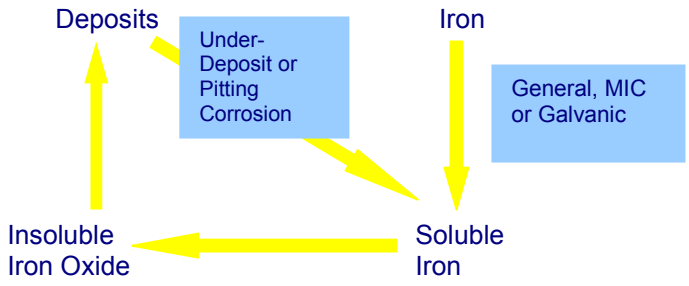

Figure 2 – The vicious cycle of iron production in closed systems

B&V Water Treatment

Why Does Corrosion Occur?

A successful and well maintained chemical water treatment program will hopefully minimise general corrosion activity to within an acceptable level - thereby eliminating any threat to the piping infrastructure. It should also minimise any secondary effects, such as under deposit pitting caused by a build-up of corrosion products and MIC. Ideally, the annual measured loss of metal for any piping system will be far less than the tolerable mil per year (MPY) corrosion limit calculated for the life expectancy of the system.

Experience has shown that a good water treatment program, well applied, and maintained, along with some additional preventative actions such as full flow or filtration, regular chemical cleanings and sterilizations, and a supplemental chemical will achieve excellent corrosion control in most cases. In many examples, however, achieved corrosion rate is dependant upon all previously applied chemical treatment their effectiveness, and the interior pipe wall conditions they have produced.

If corrosion occurs, the best place to break the cycle is to remove the soluble iron from the water before it is oxidised to form insoluble iron oxides.

Problems caused by Corrosion

Pipe corrosion represents the most serious threat and monetary loss to any commercial or industrial building or plant operation next to fire. In its less serious form, corrosion can produce problems such as lost heat transfer efficiency.

Constricted pipes – a real problem in systems with fine tubing such as “Versatemp” - these can be almost impossible to clear, annoyance pinhole leaks or temporary shutdowns. More serious failures are often in the form of major floods, property damage, operating failures, lost production and even personal injury.

Removing Insoluble Iron

Removing insoluble iron is a well established process, using a variety of techniques:
Particle Filters

- Reduces total iron level.
- Reduces pitting/under-deposit corrosion.
- Does not remove soluble, colloidal or complexed iron.
- Is at the end of the cycle so will only remove iron that is mobile.

Hydrocyclones

- As above but requires some treated water to be bled from the system each time it is emptied.

Drain and Flush

- Consumes chemicals, water and manpower.
- Particulates drop out of suspension when recirculating pumps stop.
- Requires system shutdown.

Removing Soluble Iron – Traditional Methods

The established methods all have drawbacks:
Drain and Flush

- Consumes chemicals, water and manpower
- Particulates drop out of suspension when recirculating pumps stop
- Requires system shutdown

Iron Exchange Resin

- Effective against Fe2+ ions only
- Will not remove complexed metals
- Will not remove colloidal metals
- Resin irreversibly damaged by high temperatures and pH levels

Removing Iron Using ScavSol Fe Functionalised Material

ScavSol Fe breaks the vicious cycle right at the start, before iron has the chance to become insoluble. The ScavSol process does not consume water and does not affect water treatment chemistry – inhibitors or biocides.

ScavSol Fe is effective against iron in all forms – soluble Fe2+, complexed and colloidal. It is also effective at scavenging copper in most cases.

ScavSol functionalised materials are unaffected by high temperatures/pH levels. ScavSol is the ideal solution for use in conjunction with a particulate filter or hydrocyclone.

What are ScavSol Functionalised Materials?

ScavSol materials are based on functionalised inorganic solids utilising silica and alumina frameworks. ScavSol is a family of such novel materials that contain different functional groups bound to the inorganic solid framework.

These materials have been designed with different applications in mind and can be tailored in different physical forms with varied chemical and physical properties to suit a particular application.

Case Study – Prestigious air conditioned office building in London

The 60m3 chilled water system contained very high levels of dissolved iron – insoluble iron levels were very low. Peak level at the beginning of the trial was 32.25ppm soluble iron. After some initial experimentation to determine the best ScavSol material to use, the iron levels were brought down to <0.05 ppm. Inhibitor treatment chemistry remained unaffected throughout. Ion exchange resin was applied, but had no significant effect on iron concentrations.

Complete ScavSol Service

The ScavSol service is much more than the supply of a “magic box”:

- Lab trials
- ScavSol Material Selection
- Hardware – rental or purchase
- 10” or 20” cartridges & housings for smaller systems
- GRP vessels for larger systems
- Mobile rigs
- Water analysis by ICP to eliminate interferences
- Iron (soluble & total)
- Copper (soluble & total)
- Other metals

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