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TECHNICAL PUBLICATION

INFORMATION & STRATEGY FOR THE FACILITY MANAGER

CORROSION COUPONS

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This article will discuss the use of Corrosion Coupons to measure the rate of corrosion in your water system, such as, condensers, evaporators, hot water boilers, etc. Coupons provide an inexpensive means of on-line monitoring that would allow you to measure the corrosivity of the system. If used properly, they are useful tools in gauging the efficacy of your water treatment program…and the life expectancy of your water system.

CORROSION FACTS

Corrosion is expressed in mils per year (MPY) of metals degraded. 1 mil = 0.001".

To give you some perspective, most heat exchangers tubes are 0.10" thick. A corrosion rate of 10 MPY will only take 10 years to penetrate the tube walls.

In addition to reduced life expectancy, corrosion also produces oxides as by-products that can further deteriorate your system by erosion, plugging, and fouling.

Oxides can also deposit on heat transfer surfaces, reducing efficiency and increasing energy costs.

Common sources of corrosion are, but not limited to, dissolved oxygen, bacteria, electrolysis (stray current), differential metal (dielectric), and differential cell. Other variables that can increase corrosion are flow , temperature, and pressure.

To minimize corrosion, proper design, maintenance, and water treatment program must be implemented.

CORROSION MEASUREMENT

It would be very costly to learn of a system's corrosive condition only at its demise. By then, it's too late. It is more judicious to detect any signs of corrosion early on. This can be done easily with Corrosion Coupons.

Corrosion Coupons are strips of metal alloys that are installed in a water system to simulate the corrosion of the system. The coupons come in different metal alloys to effectively simulate the different metals in the water system being monitored. By exposing the coupons to the system water for over a period of time (typically 90 days), the coupons are subjected to the same corrosion that is occurring in the system.

The coupons are pre-weighed before exposure. After exposure, they are weighed again, using proper lab preparation methods. The amount of metal lost and the exposure period are used to calculate the corrosion rate.

The visual conditions of the coupons can also give you clues as to what's happening in your system, i.e., pitting, general etching, deposition, etc.

GENERALLY ACCEPTABLE CORROSION RATES

The following are the generally acceptable corrosion rates.

Metallurgy	Acceptable Corrosion Rates	
	Open Loop	Closed Loop
Admiralty Brass	< 1.0 MPY	< 0.5 MPY
Aluminum	< 0.5 MPY	< 0.2 MPY
Copper	< 1.0 MPY	< 0.20 MPY
Galvanized Steel	< 1.0 MPY	< 0.5 MPY
Mild Steel	< 5.0 MPY	< 1.0 MPY
Stainless Steel	< 0.1 MPY	< 0.10 MPY

RELATIVE vs. ABSOLUTE MEASUREMENT

The above corrosion rates should be used as relative measurements rather than as absolute measurements. There are many variables that affect corrosion. Some of which may even be beyond one's control. A water loop that is subjected to a more severe service is likely to suffer higher corrosion. The type of application will also determine what is acceptable. For example, a nuclear cooling system will have more stringent goals than a commercial HVAC. Therefore, it would be incorrect to lump all loops under one set of standards. The corrosion data should be used to compare the stability of certain loops over time, to determine if these loops are stable, improving, or regressing.

CORROSION COUPON RACKS

Corrosion Coupon Racks are usually employed to hold the corrosion coupon(s). They are made of PVC materials while other materials are used for higher temperature and pressure applications. They come in multiple stations to hold several coupons of different alloys. The racks come with flow control valves to properly simulate the system flow. The coupons are held by non-metallic holders, to prevent dielectric potential.

The racks are generally installed as a side stream assembly. The inlet of the rack is piped to the higher pressure (discharge) side of the recirculating pump…while the outlet of the rack is piped to the lower pressure (suction) side of the pump.

You can get Prefabricated Coupon Racks for convenience or fabricate them yourself.

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