



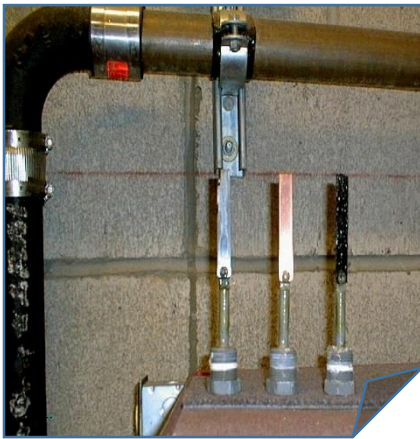
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Technical Articles & Hot Topics

Evaluating System Corrosion Utilizing Coupons

Technical Article CWT-19

Using Corrosion coupons to monitor corrosion rates in your open and closed recirculating systems is a valuable tool to evaluate and determine the effectiveness of your water treatment program. This information can be utilized to make proper adjustments to your treatment program to achieve the desired results. Corrosion monitoring also allows you to determine and influence the expected life of your equipment.



How They Work. Corrosion coupons are pre-weighted, and usually rectangular strips of metal that are of the same metal make up as your system's components. The corrosion coupons are typically installed in a corrosion coupon rack and exposed to system conditions for a determined amount of time.

Duration Installed. A minimum of 30 days exposure is required to obtain an accurate average rate, however, 90 days is typically preferred and more common. The coupons are then removed from the system and sent to the laboratory for weighing and corrosion rate results. This information can then be utilized for documenting the success of your treatment program, identifying any issues that need addressing, and for making the proper changes to your water treatment program to achieve the desired and expected corrosion rates.

Proper Installation. It is important to have the coupon rack installed in dedicated loop when possible, that remains completely flooded and has flow that is representative of the system conditions. Avoid installing the coupon rack in-line with the chemical injection ports to prevent excessive corrosion on the coupons and inaccurate results. It is recommended to install a flow meter in line with the coupon rack to monitor and maintain proper flow. Corrosion coupons will come in a dedicated envelope with the original coupon data such as, weight, serial # and type of metal, system and location. The coupons should be installed vertically to avoid excessive particle deposits that can accelerate the coupon corrosion and interfere with accurate results. Avoid touching the coupons with bare skin, oils, or any foreign material that would compromise the coupon's surface. The coupons should be installed using PVC holders and Nylon nuts and bolts when possible. Steel holders and bolts can contribute to accelerated corrosion on the coupons, and may not represent actual system corrosion.

Removing the coupon for testing. Avoid touching the coupon when removing from the rack. Dry the coupon immediately and put in the originally supplied lab envelope for testing.

The type of corrosion can be identified by inspecting the surface and condition of the coupon

Generalized Attack, or General Corrosion. Uniform corrosion over the entire coupon surface (typical corrosion expected, as long as rates are not high) can be controlled at acceptable levels by maintaining, proper filtration, flow, and treatment levels.

Pitting Corrosion. Isolated pits or indentations in the coupon metal caused by corrosion. Some causes can be from excessive flow, excessive oxygen exposure, pH excursions, under-deposit corrosion, copper plating and poor corrosion inhibitor levels.

Localized Attack=Isolated areas of corrosion-Sometimes caused by under-deposit corrosion, flow issues, oxygen pitting, fouled systems, lack of filtration, and or MIC or microbiologically induced corrosion.

Copper Plating – Caused by the deposition of soluble copper on mild steel or other non-copper alloys. This can result in severe galvanic corrosion and metal failure from pitting.

Interpreting the Corrosion Coupon Results

The corrosion rates are typically expressed in MPY which translates to Mils per year. This determines the metal loss the coupon has suffered while installed and exposed to system conditions.

Classifications of Corrosion Rates Open Recirculating Cooling Water Systems corrosion rates mpy		
DESCRIPTION	CARBON STEEL	COPPER ALLOYS
Negligible or Excellent	Less than or equal to 1	Less than or equal to 0.1
Mild or Very Good	1 to 3	0.1 to 0.25
Good	3 to 5	0.25 to 0.35
Moderate to Fair	5 to 8	0.35 to 0.5
Poor	8 to 10	0.5 to 1
Very Poor to Severe	>10	>1

Classification of Corrosion Rates Closed Recirculating Cooling Water Systems corrosion rates mpy		
DESCRIPTION	CARBON STEEL	COPPER ALLOYS
Excellent	Less than or equal to 0.2	Less than or equal to 0.1
Good	0.2 to 0.5	0.1 to 0.25
Moderate	0.5 to 0.8	0.25 to 0.35
Poor	0.8 to 1	0.35 to 0.5
Very Poor to Severe	Greater than or equal to 1	Greater than or equal to 0.5