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Don't Neglect Your Closed Loop System

Closed hot and chilled water loops are integral components of both HVAC and process heating and cooling systems. Yet despite their critical function of adding heat to or removing heat from a space or process, closed loops are the most frequently neglected components of most water systems.

Unlike steam boilers or cooling tower systems, which lose water through evaporation, closed loops are relatively tight and lose little, if any, water, and thus use very little make-up water on a regular basis. With no evaporation, they likewise do not concentrate or "cycle up", so they don't require blowdown or bleed-off like steam boilers and cooling towers. Consequently, with none of the daily or weekly water treatment tasks required, closed loops often tend to be forgotten by facility engineers and maintenance personnel.

This neglect will usually result in an operational problem or problems for facility personnel. Closed loops are particularly susceptible to corrosion. Corrosion in closed loops can result from low pH, the presence of dissolved gases such as oxygen or carbon dioxide, deposition of particulate matter (under-deposit corrosion), microbiological growth (microbiologically induced corrosion or MIC), or a combination of these factors.

Fouling due to the build-up of particulate matter is another problem that frequently occurs in closed loop water systems. Mill scale, preservatives and other materials not removed during initial construction or when piping or equipment is added to the system will be carried through the loop with the water flow and can deposit in heat exchangers, coils, etc. When corrosion occurs in closed loop piping and equipment, the corrosion products are carried away from the corrosion site by the recirculating water and contribute to fouling. Microbiological growth in the form of biofilm can further add to the fouling problem.

To make matters worse, each of these problems – corrosion, fouling and microbiological growth – causes or contributes to one or more of the others. For example, microbiological growth causes corrosion and contributes to fouling; corrosion causes fouling, which provides an ideal environment for the growth of certain micro-organisms, particularly sulfate reducing bacteria (SRB), a microbe that causes severe localized corrosion. It is easy to see that a neglected closed loop can present a facility engineer with a vicious cycle of ever-escalating problems.

The vicious cycle comes with a cost. Corrosion can necessitate costly equipment repair or replacement, and corrosion-caused leaks in loop piping can result in damage to building structure, equipment and furnishings. Fouling of coils and heat exchangers decreases heat transfer efficiency, thereby increasing electrical costs. Microbiological growth exacerbates both corrosion and fouling, increasing their severity and associated costs.

Fortunately, the vicious cycle can be broken and prevented from recurring. But it takes a well-designed and implemented plan-of-attack. All three factors must be addressed in a good program for correction and prevention of closed loop problems. An experienced water treatment representative can diagnose the nature and severity of closed loop problems and recommend a program of products and services that will stop the vicious cycle, clean up the system, and prevent the problems from recurring.

The first step in stopping the cycle involves a thorough system survey, including analysis of system water samples as well as foulant samples, if possible. Based on these analyses, the water treatment representative will recommend a chemical cleaning procedure, if the system is fouled, to completely rid the system of foulant material. Selection of the cleaning chemical will depend on the nature of the foulant - corrosion product,

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biofilm, organic material, or a combination of all three. To aid in this procedure, and to provide a means of on-going removal of potential foulants from the system, a filter will be recommended if none exists in the system.

When the loop is cleaned up, a corrosion inhibitor will be selected to provide complete corrosion protection to system metals. A number of factors will come into play in choosing the correct inhibitor, including make-up water characteristics, system metallurgy, water temperature, etc. A microbiocide may also be included in the chemical program if the system is susceptible to microbiological growth.

Finally, a testing and monitoring program must be established to assure that the system stays clean and free from corrosion and microbial growth. This should include regular water analysis for inhibitor level and the use of corrosion coupons to monitor on-going corrosion rates. A corrosion coupon rack will be specified if none is already installed in the system.

Facility managers and engineers should choose a qualified water treatment company that offers a comprehensive program of products and services to address the needs of their closed loop systems. A relatively small amount of money spent on such a program will pay huge dividends in reduced energy and equipment repair and replacement costs.

Is your closed loop system caught in a vicious cycle?

Ask your Chemtex Representative to design a program to break the cycle and put your loop back on the road to trouble-free operation!