H₂OMEYER
CONSULTING SERVICES, INC.

Closed Loop Hot Water Systems Not in Operation during Warmer Months Experience Severe Corrosion

– A technical update –

Introduction

Many facilities use hot water as a source of heating for buildings. During the warmer months heating is not needed. Therefore, the water used in the hot water systems becomes stagnant and cools down. This creates an environment for Generalized and Biologically Induced Under-deposit Corrosion as well as iron deposition on piping and heat exchange surfaces. Most buildings ignore this situation, as it is a closed loop system that is supposedly treated and protected.

Generalized corrosion, while a concern, is normally not that significant. In a closed loop system that does not use much make-up, the oxygen is normally depleted (less than 300 PPB oxygen) in the corrosion process. These systems have a tendency to go anaerobic (void of oxygen). When the oxygen is depleted, general corrosion is minimized. This process, along with the use of conventional corrosion inhibitors, such as Molybdenum, Nitrite, and Silicates, or a combination, normally do a good job stopping this type of corrosion.

The most destructive corrosion is under-deposit type corrosion, which is normally associated with microbiological growth (Figures 1, 2 and 3). Depending on the temperature of the loop during operation, there is minimal, if any, microbio growth above 140 degrees F. However, when the loop cools, microbio growth can start forming on the metal surfaces, especially when there is any form of make-up water added, or replacement of piping or components in the system.

Minimizing Corrosion

In order to minimize corrosion during this time, one should consider the following actions:

As soon as the system cools, make sure that the system receives a proactive feed of biocide and confirm that levels of aerobic and anaerobic bacteria are in range.

Make sure corrosion coupons are installed to monitor the corrosion rates during this time.

If possible, always try to recirculate the system for a short period each week to establish flow and allow the metal surfaces to see the biocide and chemistry.

Keeping these systems well protected during this time will reduce iron fouling of the heat exchange surfaces, reduce corrosion, and increase the life expectancy of the pipe.

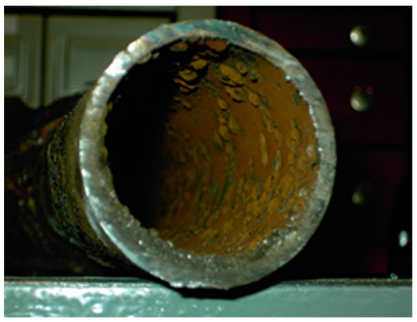
Figure 1:

Many newer chillers have approach temperatures already displayed

Figure 2:

Enhanced tube filled with microbio slime reducing heat transfer efficiency and creating potential under-deposit corrosion

Figure 3:



Under-deposit corrosion cell that lead to copper tube failure