

## Proper Maintenance for Closed-Loop Systems

### WATER MANAGEMENT FOR CLOSED-LOOP SYSTEMS

*Closed-loop systems* are a common feature of building heating and air conditioning systems and industrial process water systems. In a closed loop system, water flows constantly through a sealed piping distribution system that prevents it from coming into contact with the surrounding environment. In theory, this design eliminates water loss and reduces corrosion by preventing oxygen and other contaminants from getting into the system. But while it's true that closed loops reduce these risks, they don't eliminate them completely. Closed-loops may offer more protection than open systems, but they still need to be monitored and treated for corrosion just like any other component of the local water system.

### CLOSED LOOPS AND CORROSION

There are lots of ways that oxygen and sediment can enter closed-loop systems. They can enter when the system is newly constructed or during normal repairs. They can also flow in as part of any makeup water needed to replace water lost because of unnoticed leaks in the pipes, mechanical seals or failing air vents and pressure-reducing valves.


One of the biggest threats is the presence of oxygen in the water. Dissolved oxygen is a powerful corrosive that can easily damage the interior of the steel pipes used in the loop, releasing small flakes of rust into the circulating stream. These particles are abrasive and tend to plug piping and erode other components of the system, including mechanical pump seals. They can also adhere to the waterside surfaces within the loop, building up layers of material that can block pipes and reduce the efficiency of the heat-transfer process. These build-ups also promote a form of concentrated corrosion known as under-deposit corrosion, which can quickly damage the pipe underneath.

Organic debris represent another potential threat. Organic material helps to promote microbiological growth, which can foul pumps, impede water flow and allow for under-deposit corrosion.

### BEST PRACTICES FOR MAINTAINING CLOSED-LOOP SYSTEMS

The best practice for preventing corrosion in closed-loop systems is to use chemical monitoring and treatment to maintain the water chemistry in combination with a side-stream filter to keep the water free of suspended solids.

The process starts when the loop is first installed. All of the components of the piping distribution system should be thoroughly cleaned before being placed in service. The best approach is to use a purging compound to clean and flush mill scale and other debris from the loop. It can then be treated with a corrosion inhibitor to keep deposits from forming on the waterside surfaces. These steps will remove solid materials that could promote corrosion and protect the waterside surfaces from damage. Once the loop is placed in service, it's important to keep the water clear of suspended solids. A side-stream filter is an efficient and cost-effective way to do this. As water circulates through the loop, 5-10% of the stream is diverted to the filter. The filter captures any solids that might be present and



allows the clean water to return back to the main flow. An advantage to the side-stream approach is that if for some reason the filter becomes blocked, the flow of water through the loop will still continue.

It's also important to establish a routine schedule for monitoring the water chemistry within the loop. One important test is to ensure that the water contains an appropriate level of corrosion inhibitor. Corrosion coupons that are constructed of the same material as the loop can also provide a good indication of the effectiveness of the corrosion treatment program. Aside from corrosion testing, the monitoring schedule should also include testing and treatment for microbiological growth. It should also include visual inspections to make sure that there are no leaks in the system. Small leaks can sometimes go for weeks or months before being detected, allowing oxygen to trickle in and damage the system while water and corrosion inhibitor leak out.

Once the monitoring tasks and schedule are established, they should be documented as part of the site's Water Management Plan. Likewise, all testing and treatment activities need to be recorded, along with the results.

### **FOR MORE INFORMATION**

Depending on the situation, closed-loop systems may offer a more cost-effective solution for your heating, cooling or process water problem. If you have questions or would like more information on this topic, please contact us at Solid Blend. Our qualified professionals would be happy to assist you.