



Does a closed system need chemical treatment?

Good reasons why the answer is “yes”
Some misconceptions about closed systems.

Closed systems are sealed off from the atmosphere and circulate the same body of fluid all the time. Therefore, they are quite stable and never need any form of chemical treatment to protect them. **Right?**

Well of course we all know this is not quite true. Modern automobile cooling systems are essentially closed loops, but would you ever consider running one with only plain water? We know what the result would be – rusty water and soon a bill for a new water pump.

The effects on a closed loop system used for any kind of heating or cooling are the same – **corrosion, deterioration of components and loss of heat transfer efficiency**. What causes this?

The make-up water that is used to fill a closed loop contains **dissolved oxygen**. Mild steel and iron corrode rapidly under these conditions releasing small flakes of rust into the circulating stream. These particles are abrasive and tend to erode the components of the system. This can be particularly harmful on pump shaft seals.

What about after all this oxygen has been used up. Won't the system become stable and no more corrosion takes place?

Perhaps in an ideal situation, but if we discount for a moment the damage that will be done to a new system, can we guarantee the water in this system will never reach a stable condition? There are several reasons why we cannot. Consider this;

Most so-called closed loops are not truly closed. There must be a provision made to automatically compensate for any pressure changes or water losses. To accomplish this, the system will normally utilize an expansion tank and relief valve, at the same time being connected to the water main via a pressure reducing valve (PRV).

Expansion tanks usually have a volume of air trapped above the water. The oxygen dissolves in the water and is then circulated throughout the system. **Make-up water enters the system** because of bleeding air or water leaks from the loop, bringing with it a fresh supply of dissolved oxygen. Sometimes quite substantial leaks or losses can go undetected for a long time since the PRV automatically makes up for them.

The net result of this is the introduction of a small but continuous supply of water containing corrosive oxygen. The problem is aggravated considerably if the system is opened for any kind of routine maintenance or component replacement. As corrosion in the loop continues, heat transfer surfaces become coated and lose efficiency, and tubes become plugged. Layers of debris lead to an effect known as **under-deposit corrosion** which can cause **pitting**, a form of concentrated, localized corrosion. Pitting should be avoided at all costs because it leads to rapid perforation or component failure.

How can you tell whether a system has problems?

Some simple tests on the circulating water will give a very good indication of whether things are not under control;

Appearance: Check the colour and clarity of the water. It should be almost clear and colourless. Dark brown or black water indicates a serious corrosion problem. There should be very few solid particles collecting at the bottom of the sample container.

Check the filter: If there is a filter on the system, check the cartridge to see what kind of solid material, and how much, is being removed from the circulating system.

Dissolved Iron and Total Iron Tests: If the sample contains more than 1 ppm iron in either of these tests, the system may be corroding and needs to be brought under control as soon as possible.

How can you restore control using chemical treatment?

A closed loop chemical treatment program should provide the following:

pH Control: Overcoming the effects of low pH water supply is accomplished by a suitable pH adjustment additive.

Oxygen Scavenger: Dissolved, corrosive oxygen is continuously removed from the water before it can cause any damage.

Film-forming, corrosion inhibitor: By coating all internal surfaces of piping and equipment with a protective, monomolecular film, we ensure that no attack is possible. Pace's **BAR COR CWS** series of corrosion inhibitors is recommended for all closed systems.

What else can be done to protect a closed loop system?

Start with a clean system: If the loop contains dirty water and large amounts of rust and mill scale, clean and flush it using **PURGEX L-724**, a purging compound designed for this purpose. After thorough cleaning and flushing of the system, the addition of the **BAR COR CWS** series of corrosion inhibitors would then be able to provide protection to all parts of the system, and the pumps and heat-transfer equipment will operate at design efficiency.

Measure the corrosion inhibitor concentration regularly: The inhibitor cannot do its job if it is being continually diluted because of continuous water leaks or draining parts of the system for maintenance.

Check for leaks: If leaks are suspected, installation of an inexpensive totalizing water meter in the make-up line will provide early detection.

Inspect equipment: Any defective components, especially around the expansion tank area that could admit oxygen to the system, should be repaired or replaced as soon as possible.

Check the filter cartridge: Regularly inspect the filter cartridge. If solid material is circulating because of under treatment or contaminated raw water resulting from reservoir or water main repairs, take appropriate action.