Cooling System Start-Up and Shut-Down

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Even if a cooling system is well taken care of during the operating season, damage can occur if proper season start-up or end of the season shut-down procedures are not followed.

At the start of the season when cooling systems are first filled with water, the corrosion mechanism will also begin in these unprotected systems. Many systems are filled with fresh water and are then run intermittently. Chemical treatment levels remain low because the system has not cycled up to normal levels. Due to interruptions in operations, biocides may not be added on a regular basis. Oils and greases used in preparing the systems for operation may initially contaminate water side surfaces. Lack of biocide addition along with organic contaminants provide a perfect atmosphere for bacterial growth that may cause severe corrosion. Stagnant water allows for increased microbiological activity along with drop-out of suspended impurities.

Without proper start-up, conditions occur that will result in problems that may damage the system and take most of the cooling season to correct, if, even possible. The following steps will help prevent initial problems:

1. If the cooling tower basin is dirty from sitting idle, flush with fresh water to drain.
2. Upon filling with fresh water, add twice the normal level of corrosion inhibitor and circulate for 48 hours. If possible use a special product designed specifically for pre-filming a system such as MolykoteXP.
3. If a system is running intermittently, make sure biocides are added and circulated for at least two hours on a weekly basis.
4. Initially run the system at lower cycles of concentration to prevent drop-out of foulants during off-line times. It may also be desirable to add a special dispersant to help keep impurities in suspension.
5. Use common sense. Try not to drain the system piping once filled. If the system pipe is drained, rust will begin to form. Flushing and pre-filming will need to be done again.

Proper start-up will extend the life of the cooling system piping and equipment. Less problems will be encountered during the regular cooling season.

Just as proper start-up is important to the integrity of the cooling system, proper shut-down and lay-up are also extremely important. Corrosion, fouling and scale may form in a cooling system that is improperly taken off-line at the end of the cooling season. Many cooling systems are again operated on an intermittent basis. Poor or no chemical treatment normally occurs during this time. Suspended solids will begin to drop-out during periods of off operation. High levels of scaling impurities may also result in precipitation. Lack of biocide addition will allow microbiological growth. When pipes are drained and then refilled, the corrosion process will begin resulting in system metal loss. If piping is not properly taken care of after shut-down, out-of-service corrosion can cause a severe problem.

Out-of-service corrosion normally shows up during the following cooling season when iron scale or so called pipe slag breaks loose and begins to plug distribution nozzles, pump strainers and even tube bundles. Pipe slag forms when non-continuous wetted pipe begins to rust and water impurities are left behind after evaporation. Pipe slag can be as thin as a piece of paper or as thick as a silver dollar. Pipe slag that is wedged in condenser tubes will result in lost flow and loss of cooling efficiency. This type of problem can be solved by taking proper steps when taking a system off-line for the season.

The following procedures will help maintain the integrity of the cooling system during annual shut-down:

1. As the season winds down, decrease cycles of concentration. This will prevent high levels of dissolved and suspended solids from dropping out when the system is off-line.
2. Before shut-down, add a non-oxidizing biocide at maximum level to kill any biological growth that may be in the system. Remember stagnant water provides conditions that maximize biological growth.

3. A separate dispersant and/or bio-dispersant may be added to loosen and penetrate existing foulants.
4. To control out-of-service corrosion, a special post-film chemical should be added to the system and circulated. The use of Chemtex Molykote XP will provide superior corrosion protection for the system metals. Use of this type of product will inhibit the formulation of pipe slag. This product should be added approximately three days before system shut-down
5. Once the system is brought off-line, drain all pipes and tower sump to prevent freezing. If possible, power wash or flush all mud and debris from the tower sump.
6. If the condenser is to be laid up wet, the unit should first be drained of all tower water. Add fresh make-up water along with a non-oxidizing biocide and a high level of corrosion inhibitor for corrosion protection.
7. Chemical feed and control systems should be taken off-line and cleaned. Conductivity and pH probes should be removed, cleaned and properly stored. Chemical feed pumps should be flushed with fresh water.

By following these suggested steps for cooling system start-up and shut-down, severe problems can be averted. These preventative steps will extend the life of cooling systems, provide more efficient chemical use and possibly save a tremendous amount of energy dollars.