WATER TREATMENT NEWS

MAKE CERTAIN YOUR COOLING SYSTEM IS PROTECTED DURING LAY-UP

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You've worked hard all spring, summer and early fall keeping your cooling system free of scale, corrosion and microbiological growth and operating efficiently. You made sure inhibitor levels were kept within recommended ranges and checked the bleed-off controller on a regular basis to assure that proper cycles of concentration were maintained. You made certain that the biocides were added and checked the system visually *and* with dipslides to assure that bacteria levels were under control. All this time and effort has paid off -- your tower remains clean and the chiller is purring like a kitten.

Now it will soon be time to shut the system down for the winter. Don't let all your hard work keeping the system running smoothly go to waste – follow these guidelines to assure that your system stays protected all winter long and is ready for a trouble-free start-up next spring.

Water Treatment Program Shutdown and Lay-up Procedures

If the correct chemical program procedures are not followed during the final week of cooling system operation, corrosion is likely to occur in the cooling tower and in system piping during the off-season. This corrosion results in the formation of "pipe slag," a corrosion product in the form of rust chips that break loose from the pipe walls when the system is refilled in the spring. The chips are carried along in the water and deposit on the inlet side of the condenser tube bundle, causing loss of flow and decreased cooling efficiency.

The following water treatment program shutdown procedures will help prevent the formation of pipe slag and biofilm, providing for a smoother, more trouble-free start-up the following spring:

1. As the cooling season nears the end, begin reducing cooling water cycles of concentration. This removes dissolved and suspended solids from the system, preventing or reducing drop-out when the system is drained.
2. Before shut-down, add an oxidizing biocide such as bromine or chlorine dioxide at maximum recommended dosage to kill bacteria and other micro-organisms in the cooling water. During times when the system is idle for extended periods, it is recommended to run the recirculating pumps and add additional biocide to maintain microbiological control. Even during cool weather, microbial growth will occur in stagnant cooling water.

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3. Add a separate dispersant or bio-dispersant to penetrate and loosen existing foulants.
4. To control out-of-service corrosion, circulate a post-film chemical treatment such as Molykote XP, a lay-up chemical produced by International Chemtex Corporation (Chemtex), for 72 hours prior to shutdown.
5. 12 hours prior to shutdown, add a vapor phase corrosion inhibitor such as Vaprotex 2000. This product, also available from Chemtex, provides additional corrosion protection to both wetted and non-wetted surfaces.
6. When the system is shut down for the final time, drain all pipes and tower basin and sump to prevent freezing. If possible, power wash or flush all mud and other debris from the basin and sump.
7. If the condenser is to be laid up wet, the unit should first be drained of all tower water. When drained, add fresh water, along with high levels of non-oxidizing biocide and corrosion inhibitor.
8. 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.

Following these procedures will not only help prevent the formation of pipe slag and biofilm, and provide for a smoother start-up in the spring, it will also extend the useful life of the entire cooling system.

Mechanical System Shutdown and Lay-up Procedures

When the facility no longer needs cooling, the cooling system itself needs to be prepared for storage.

Refrigeration Systems

1. Pump the refrigerant into the receiver or condenser, according to the chiller specifications. Close the inlet and outlet valves. Check the vessel connections for leaks.
2. Check the relief valves on the condenser and receiver for leaks.
3. Disconnect and tag the power supply to the control circuit to prevent compressor operation during the time the unit is shut down.
4. Check the refrigeration system and piping for required repairs or changes necessary before the system is restarted in the spring, such as piping supports, piping modifications or control changes.
5. Calibrate and adjust pressure gauges and thermometers.
6. Check safety controls for proper operation and settings.
7. Perform diagnostic test on microprocessors.
8. Test and calibrate refrigerant monitors.
9. Clean and tighten electrical connections.
10. For lithium bromide absorption machines, the refrigerant water should be laboratory tested for contaminants. The lithium bromide solution should be tested for inhibitor level. Any necessary adjustments to these solutions should be made.

Compressors and Motors

1. Disassemble the compressor and check for valve wear, bearing wear and other potential problems.
2. Drain and clean oil reservoirs, oil filters and strainers.
3. Collect an oil sample to be lab tested for acidity, and a separate sample to be tested for trace metals. The trace metals would be an indication of wear on the machine.
4. Check oil heaters and controls for proper operation.
5. Check and record thrust bearing end clearance. An increase of 0.003" or more should be checked out by removal of the bearing. Replace the bearing, if necessary.
6. Inspect inlet dampers mechanisms for cracks and wear. Replace, as necessary.
7. Clean all sight glasses.
8. Inspect and overhaul purge units as required.
9. If speed-increaser gear sets are used, drain oil and replace with clean fresh oil. Inspect bearings and gear teeth for wear, and replace as necessary.
10. Check open-drive unit coupling for wear and alignment.
11. Clean motor windings and lubricate bearings. Motors subject to weather or airborne contaminants should be covered.

Heat Transfer Surfaces

1. Brush condenser tubes to remove mud, debris and other loose sediment. Use a nylon brush or one of similar material. When cleaned, inspect condenser tubes for signs of corrosion.
2. If scale is present, it may be necessary to chemically clean the tubes. If scale has deposited since the last inspection, the water treatment program should be reviewed for correct operation: was scale inhibitor feed interrupted, and for how long? Were correct inhibitor levels maintained at all times?

Cooling Towers

1. Disassemble float and ball-cock valves on the tower make-up line; clean and rewasher the valves.
2. Wash the interior of the cooling tower and the tower fill using high pressure water.
3. Clean tower distribution pans and spray nozzles, if present.
4. Drain the tower basin, recirculating pump and piping. If the tower will be exposed to freezing temperatures, the pump and piping should be air-blown to remove all water.
5. Condenser water piping not subject to freezing should be left filled with water containing a post-film inhibitor and a vapor phase inhibitor as described above.
6. Close and lock automatic fill valves.
7. Remove and clean all strainers and screens.
8. Inspect tower fans and fan drives for wear, cracking, corrosion and any other conditions that may cause future operational problems.
9. If possible, cover fan and louver openings to limit the amount of airborne dirt and debris that enters the tower during the off-season.
10. Winterize pumps using a foamed lubricant; check and lubricate pump motor bearings.

Air Handling Unit Coils

1. Completely drain coils and either air-blow or flush with anti-freeze solution to prevent damage by freezing.
2. Clean the exterior of the coil and drain and clean condensate pans. Make certain condensate pan drain opening is completely clear of any dirt or debris, and condensate can drain freely.
3. Check freezestat controls in air ducts for proper operation to prevent sub-freezing air from passing over undrained chilled water coils or heating water coils.
4. Install freeze alarms, if not present, in ducts where damper mechanism failures, pump outages or other control failures could cause coils to be exposed to freezing conditions.

By following the cooling system lay-up procedures outlined here, the cooling system owner or operator will help assure that damage does not occur to his system, the start-up of the system the following spring will be smooth and trouble-free and the system will operate reliably and efficiently during the cooling season.

Do you need help with the lay-up of your cooling system?

Ask your Chemtex representative for help with the waterside of your system.
Consult a qualified cooling system technician for help with the mechanical side!