Evaporative Condenser

Problems & Maintenance

Scaling, tower corrosion problems and algae formation all result from having an improper, or non-existent, water treatment system. These types of towers evaporate a great deal of water. Assuming an average 50 ton load, which is half of the system operating, approximately 74 gallons per hour is evaporated with the minerals of this water remaining in the tower sump. Considering that this system has been operating at a 100% load because of the building issues addressed hereafter, almost 150 gallons per hour has been evaporating from this system for months. One can just imagine the concentration of minerals in the tower-sump water, as a result of this ongoing evaporation process.

Management of a refrigeration system's tower water concentrates on two (2) primary areas of concern. They include "algaecides" to prevent the growth on microbiologicals within the tower water, and "bleed" systems to eliminate the high concentration of minerals which occur during the evaporation process.

Algaecides come in many forms. These chemicals are slowly introduced to the system, based upon the expected life cycles of the water within the tower, temperatures, and quality of pre-treatment for incoming water. Maintenance of a cooling tower ensures proper operation and keeps the cooling tower from becoming a niche for breeding pathogenic bacteria, such as Legionella organisms. Cooling tower water quality must be properly monitored and chemical treatments used as necessary to minimize conditions that could support the growth of significant amounts of pathogens. Chemicals do little, to nothing, in the process of avoiding mineral deposit from being formed on the coil surfaces.

Algaecide/chemical treatments are usually given the primary attention by vendors selling this type of service. Often, systems are significantly overfed with more chemicals than needed, to maintain a clinically safe environment. The companies which often provide the equipment for automatically feeding these chemicals, along with the sale of the chemicals, are the same people most owners rely on for testing the water and deciding the amount of chemical to added. Since they make their living from the sale of such chemicals, efforts to reduce product utilization are rarely a consideration.

There are often conditions where the amount of chemicals for microbiological control is actually quite low. Situations where the water is introduced to the tower in a highly chlorinated state, systems which have a quick water turn-over because of "bleed" water control volumes, or cold temperature applications, can usually get by with little chemical additives.

Bleed systems are designed to maintain concentrations of mineral content in the tower water to a level which will not promote separation of the mineral from the

water and attachment of these minerals to surfaces of the tower. While some areas of the country have acidic water, most water supplies are either neutral or slightly alkaline in form. These terms all relate to the PH balance of the water. Maintaining a neutral PH level is very important to the life and performance of refrigeration towers.

A system operating with a water PH too high, will form mineral contents on the heat exchanger surfaces robbing precious efficiencies. maintaining too low of a PH level will result in acidic water eating away at the tower galvanizing until the metal of the tower eventually fails. Poor water treatment can lead to a tower demise in only a few short years. Your complex is evidence of what can happen to a tower in only two (2) months time without proper water treatment.

The bleed system maintains a balanced PH by monitoring and maintaining the mineral content, based upon a PPM (Parts Per Million) measurement. Bleed systems include an electronic sensor which measures the conductivity of the water. The conductivity values of water changes with the concentration of minerals that make it an ideal method of control. A bleed system will monitor the values in the water. As the evaporation process occurs, the concentration of minerals in the remaining water which has not evaporated will increase. When the sensor reads that the PPM of the tower water has reached 1500 PPM, the bleed controller will open an automatic valve on the discharge side of the tower pump, pumping a predetermined value of tower water directly to waste. This controlled emptying of the tower will cause fresh water to be introduced to the tower sump, thereby, diluting the concentration of minerals. This automatic valve to waste will remain open until the PPM reading has dropped to 300 PPM where it will close. It will remain closed until the concentration once again reaches 1500 PPM. Often, this water is recaptured for landscaping operations or similar uses.

The primary mineral in your water supply is calcium. Calcium concentrations of new water depend greatly on the area. Some areas of the country have fresh water values of 50 PPM, while other areas of the country have concentrations over 100 PPM. Florida has a reputation for being on the higher level of what is often termed water hardness. When the entering water is a higher value, the amount of bleed water will need to be greater. It is not uncommon to bleed almost as much water as is evaporated from the tower. For example, if the system is operating at a 50 ton load and evaporating 74 gallons per hour, another 74 gallons of bleed water could be required to maintain a safe water quality level in the tower.

Using lake water for the tower is worthy of consideration. For this application, it may be worth while to invest in a pool-type filter and chlorinating system for introduction of the water to the tower. Other than testing the water for other minerals, lake water with a pool filter and chlorinating should be as suitable as city water.

Evaporative Condenser Scaling
REPAIR OF TOWER PROBLEMS

Calcium scaling on the coils must be removed to permit efficient operation of the system. Cleaning calcium deposits is not a part of regular maintenance and it is always an effort, after no maintenance has occurred. While acid cleaning does remove the calcium and permits the system to operate more efficiently, the method of acidic washing used significantly reduces the service life of the tower.

Typically, calcium is removed from the coils with an acid solution which is introduced and circulated through the system. The acid will slowly remove the calcium deposits and leave a clean coil. The acid levels are monitored by the quantity of calcium to be removed. This works well when the calcium is evenly distributed over the entire coil surface. This is not the case for your tower.

The acid used to dissolve the calcium also attacks and dissolves the galvanizing coating which protects the sheet metal and heat transfer coils within the unit. Acid washing your tower should be a last resort only if the condition does not dissolve with an aggressive water treatment program. An acid wash could literally take years of useful life out of the tower.

A good bleed system will stop any further calcium build-up within the system. More than likely, an aggressive bleed system will also show improvements to the current condition in 30 to 60 days after implementation. If this condition cannot be removed with normal maintenance of the water PH, the acid washing can always be scheduled in the near future.

Of the priorities with this condition, a bleed system must be employed. Arena personnel should check the tower once per week to confirm that the spray nozzles are cleaned and the strainer is free of obstructions. The need for checking the tower once per week will diminish after a proper water treatment system has been employed. The drain valve on the bottom of the tower should be manually opened slightly just to permit a small amount of water to continuously drain from the system until an automatic system can be installed.

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