

REFRIGERATION REVIEW

Condenser Water Treatment

Water treatment has been a subject of many discussions and can get quite complicated for laymen, including myself. Borrowing from my friend, David Frackelton, whom I would consider an expert in water treatment, I have the following synopsis which he provided for water treatment of evaporative condensers.

The three basic controls of water that need to be monitored are pH, conductivity, and chlorine content.

pH needs to be monitored because it needs to be maintained above 6.0 or corrosion will cause damage to the metal. Generally, city water will be less than 8.2, which is the upper limit. If it becomes necessary to correct pH, a very affordable mild acid can be provided. Evapco recommends sulfamic acid, which is weaker than hydrochloric-based acids.

Conductivity is measured in MHOS. City water is around 100 MHOS, and the expectation after evaporation is that it would be in the are of 1,000 to 2,000. It is considered desirable to maintain a ratio of 8-10 of concentrated water to fresh water MHO value. A good meter to look at is the Omega CDTX-45 Conductivity Transmitter with the CDE-45P sensor. This is a four-electrode titanium sensor that can compensate for the electrodes becoming coated over time, eliminating the need for constant cleaning. This sensor is also temperature compensated, integrating an RTD to read the current water temp for an accurate reading in micro Siemens. The total cost for the sensor and transmitter (using the 24VDC power supply) would be \$1692.31, but the mounting hardware (if needed) would be another \$95. These can be used with a solenoid valve to the automatic bleed-off water when it becomes too concentrated with solids.

City water is usually provided with a **chlorine content** of 1 ppm. Chlorine tends to evaporate rapidly from water, so there will be occasions when it will need to be added to prevent biological growth in the condenser. This can be provided with a simple by-pass with a basket which can be isolated with valves so that chlorine tablets can be placed in them, if the concentration becomes less than 1 ppm.

Below is an article from the ACHR News with the following recommendations.

Chemical treatment programs must meet the following requirements:

- 1.** The chemicals must be compatible with the unit materials of construction as well as other materials used in the system (pipe, heat exchanger, etc.)
- 2.** Chemical scale and corrosion inhibitors, and particularly acid (if used) should be introduced into the circulating water through automatic feeders at a point in the system where total mixing and dilution occur before reaching the evaporative cooling equipment. The preferred injection point for chemical scale and corrosion inhibitors is on the discharge side of the system circulating pump(s). These chemicals should not be batch fed directly into the unit's cold water basin or water distribution system, as this can severely damage areas directly contacted.
- 3.** When chlorine is added to the system, free residual should not exceed 1 ppm. Exceeding this limit may accelerate corrosion.
- 4.** Closed circuit cooling towers and condensers only: Unless a common remote sump is utilized, each cell of a multi-cell coil product must be treated as a separate entity, even if the cold water basins are flumed together or equalized.