

Recommendations for Maximum Life of Cooling Tower Lumber

From 1950 to 1961, the Cooling Tower Institute conducted the only comprehensive field study relative to deterioration of lumber in industrial cooling towers. This study assessed several variables involved in normal water conditioning and pressure pretreatment. This information as well as current practices and technology, provides the basis for these recommendations for cooling tower lumber care and maintenance. These guidelines will help extend cooling tower lumber life.

Pressure Pretreatment

New Towers: When Douglas-fir or redwood is the material of construction, all lumber should be pressure pre-treated in accordance with CTI Standard WMS-112. (Heart redwood grades, without sapwood, are sometimes chosen to be not pre-treated due to their specific application.) Existing tower's: Replacement material will be pressure pre-treated, as above.

Spray Treatment

Existing Towers: There is a wide discrepancy between and among the types, grades and sub-grades of lumber used to construct and repair cooling towers. No two trees or two forests are the same. Even when treatment is done in accordance with CTI Standard WMS-112, treated lumber may fall short of the 0.4 inches of penetration specified.

Because of this natural diversity in decay resistant characteristics, premature wood decay in the non water flooded areas is found in every geographic region, under all water treatment programs, and within the whole range of water quality used. Experience has shown that wood decay in the non-water flooded areas can be forestalled or minimized through the use of remedial preservative spray treatments.

The Cooling Tower Institute recommends non water flooded areas to be preservative spray treated to prolong the expected useful life of the structure. Spray application of a 5% or better solution of tri-butyltin oxide, or other suitable approved wood preservative, applied once every year in the non water flooded areas and the fan deck top is recommended. To be effective, a complete coating of the non water flooded areas framework is essential.

In timber structure cooling towers, enclosed non-water-flooded areas, such as the plenum area, are especially susceptible to decay damage. Ideal conditions for decay organisms exist here and these areas are not protected by the biocides added to the recirculating water system.

Notwithstanding initial lumber quality, and other considerations unique to a specific tower, the following are factors used to evaluate the greater need for remedial preservative spray treatment.

Factors Which Enhance Decay Risk In Any Tower

- a. Any tower which has experienced internal biological decay.
- b. Any tower with lumber that may have had adequate initial pressure treatment but that has begun to develop noticeable grain splits prior to or after construction.
- c. Any tower with lumber that falls significantly below the recommended values for initial pressure preservative content, regardless of age.
- d. Any cooling tower that uses treated municipal sewage effluent as the primary make-up source.
- e. Any cooling tower located at refuse to energy plants, due to high concentrations of ambient decay organisms.
- f. Any cooling tower located in higher risk geographic areas which generally follow AWWA Geographic Deterioration Zones for wood used in ground contact.
- g. Any cooling tower which experiences alternate drying and wetting cycles of operation, as in seasonal, intermittent or periodic operation.

Water Conditioning

The following are recommendations for maximizing the life of cooling tower lumber in the wetted or flooded areas of the cooling tower. In these areas protection is achieved by additions to and control of the quality of the recirculating water.

1. Recirculating water pH between 6.0 and 8.0 is preferable in preventing delignification of cooling tower lumber. However, today's safety and environmental considerations, e.g. acid elimination or operation at higher cycles of concentration to conserve water, may preclude the maintenance of these pH levels in recirculating waters.
2. Whenever possible, free hydroxyl ions (OH⁻) should be avoided. This requires a pH at or below 8.3, since these ions are known to attack the wood binders.
3. Effective control of microbial activity is essential. This may be accomplished through the use of either oxidizing or non-oxidizing biocides. Oxidizing biocides used on an intermittent basis, maintaining a free halogen residual less than 1.0 ppm, measured in the hot water return line, are acceptable. Oxidizing biocides used on a continuous basis, maintaining a free halogen residual less than 0.5 ppm, measured in the hot water return line are acceptable. Strong oxidizing biocides, such as chlorine, when administered frequently and at dosages above 2-3 ppm free halogen residual, may cause attack to cooling tower lumber, particularly under highly alkaline conditions. However, the degree of attack versus the other costs and operating benefits of using these materials has to be compared.
4. Most water treatment chemical compounds used today for scale, corrosion and deposit control are not known to be harmful to cooling tower wood, nor are they protective. It is suggested that pieces of tower wood, especially when a tower is first built, be suspended in various places throughout the tower, deck and sump so destructive testing can be performed on these samples rather than the tower wood itself.
5. Questions concerning chemical or biological attack of cooling tower lumber should be addressed to the water treatment chemical vendor or water consultant used by the facility.