



Water Talk

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The Use of Reclaimed Water as Cooling Tower Make-up

The Water Crisis that exists in the Southwestern USA has resulted in efforts to use treated waste water as cooling tower make-up in all industrial and commercial locations. The terminology for treated waste includes reclaimed water, recycled water, grey water, Title 22 Water and others. In addition many industrial plants treat their own internal waste for recycling in their facilities.

Reclaimed Water, sometimes called Recycled Water, is former wastewater such as sewage that has been treated to remove solids and certain impurities and then used in sustainable landscaping irrigation or to recharge groundwater aquifers. The recycling and recharging is done for sustainability and water conservation.

Grey water is wastewater generated from domestic activities such as laundry, dishwashing and bathing which can then be recycled on-site for uses such as landscape irrigational and constructed wetlands. It would not include from toilets containing human waste.

In many parts of the world, reclaimed water is more expensive than potable water, but is often sold at lower cost to encourage its use. However in arid regions of the Southwest USA this is not an issue. Reclaimed water has to be used to conserve fresh water supplies for potable use as the population of the world increases.

Public Health concerns have been raised by the EPA in 1997 regarding the problem of bacteria in reclaimed water which could result in the spread of disease if used in sprinklers. Parasites such as giardia and cryptosporidium are also of concern.

Reclaimed water is not regulated by the Federal EPA, but by the states. Each state has its own regulations and concern over bacterial organisms is of wide concern. California Code of Regulation Title 22 is one of the more comprehensive of these state regulations. The Bay Area, Los Angeles County, Irvine Ranch and San Diego lead the state in widely promoting the use of reclaimed water.

Reclaimed water is distributed in purple piping to distinguish it from potable water and some of its uses are for:

- Irrigation
- Street-sweeping
- Power generation.
- Decorative fountains
- Fire protection
- Dust control
- Aquifer recharge
- Cooling towers make-up.

Typical processes used to convert waste into reclaimed water are:

- Screens and other processes to remove sand or debris.
- Sedimentation removing large solids
- Microbiological breakdown of organic materials
- Clarification removing microorganisms and remaining solids

- Filtration to make the water clear
- Disinfection, usually chlorine which kills microorganisms

When using reclaimed water as cooling tower make-up, it is important to know the water chemistry and its variation day to day. Some of the issues commonly encountered are:

- Ammonia or chloramines. These ingredients will be corrosive to copper and copper alloys. Some ammonia will gas-off in the cooling tower especially at very high pH. However it may be necessary to add additional copper inhibitor to the system to protect the metal. In addition ammonia and the amines add to the microbiological growth potential so continuous feed of an oxidizing biocide may be necessary.
- Organic matter which may show up as BOD or COD can be a major source of nutrients for microbiological growth. If the water has a high nutrient concentration the continuous feed of an oxidizing biocide is preferred. This could be chlorine, bromine, chlorine dioxide, ozone and others.
- Phosphate may be present and may vary from day to day, hour to hour or minute to minute. If this is the case the program should be focused on preventing calcium phosphate deposition and a stabilized phosphate program using the phosphate in the reclaimed water may be the answer. One common mistake is to review the cities analysis numbers and see the phosphate is low and no problem. Cities normally record phosphate as ppm as P and the ppm as PO₄ is 3.06 x ppm as P.

Clearly the water analyses are important when designing a treatment program for facilities using reclaimed water. The variation in water analyses is also very important. Reclaimed water can and is widely used as cooling tower make-up and can be effectively treated if the upfront analysis of the water components and variation is studied. The correct treatment protocol can then be applied.