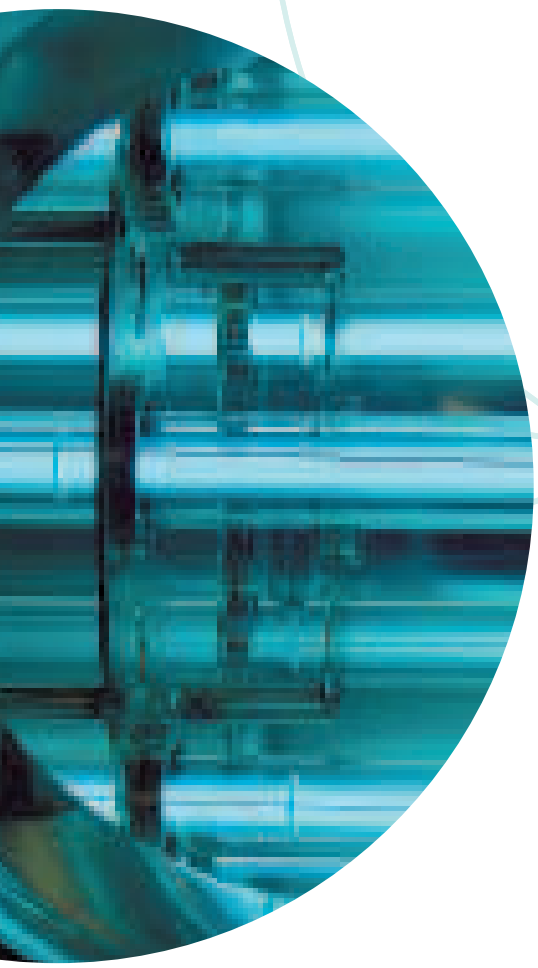
Cooling Tower Water Treatment

Using Ultraviolet Light and Filtration



To allow water treatment professionals to provide another value added service to their clients and to help facilities improve efficiency and lower costs, here is some basic information regarding cooling tower and recirculation loop water treatment. This article will focus on integrating UV disinfection and filtration into existing systems to help reduce chemicals and improve system performance.

About Cooling Towers

Cooling towers and recirculation loops are considered heat rejection systems. They move heat to the atmosphere through the cooling of water to a lower temperature. Some common applications for cooling towers are air-conditioning systems, water-cooling of equipment and general manufacturing needs.

The type of heat rejection in a cooling tower is defined as "evaporative" in that it allows a small portion of the water being cooled to evaporate into a moving air stream to provide significant cooling to the rest of that water stream.

As this happens, the cooling towers become efficient air cleaners (scrubbers). This process allows airborne contaminants and particles to become deposited into the cooling water. This, combined with the contaminants in the feed water, creates an environment for microorganism growth, solid deposits and scaling.

Microorganisms tend to thrive in the recirculated water and on wet surfaces. Bacteria, slime and algae foul heat–exchanger surfaces and in some cases attack and destroy system components.

Cooling Tower Water Problems

Some common cooling tower water problems include:

- Microorganism growth;
- Reduced system efficiency;
- System downtime for cleaning; and
- Reduced equipment life.

Current Treatments

In order to combat the biological growth problems, facility operators generally use chemicals (biocides) to stop bio-growth.

While the use of chemicals helps control the overall biological problems, this solution does have some downsides such as:

- It is hazardous to operators;
- Chemicals are expensive;
- There are costs associated with storage and insurance; and
- Constant feeding of chemicals.

Alternative Treatment

Ultraviolet (UV) light, which is a proven technology for drinking water, can be applied to the treatment of cooling tower water. As with drinking water, cooling tower water enters the UV system where it is exposed to high doses of UV light. The UV lamps produce light in the 254 nm wavelength. At this wavelength, UV light targets the microorganism' DNA. Exposure to the light scrambles the DNA and prevents the microorganisms from reproducing.

Benefits

Some common benefits of UV light cooling tower water treatment are:

- It is environmentally safe – no chemicals;
- No operator licensing is required;
- Effective on a wide range of pathogens;
- Low operating costs;
- Continuous operation;
- Low maintenance; and
- Significantly lowers the need for biocides.

In order to make the addition of UV a reality, the cooling tower water treatment will also need to include a filtration system. The use of basic filters (40 to 50 micron) will help remove the solids from the water. This will make the UV more effective and prevent solids from settling elsewhere in the cooling loop.

This has a two-fold impact. The first is that it will prevent the UV system from becoming fouled and the second is that it will lower the maintenance on the actual cooling equipment (condensers and exchangers).

Integration and Sizing

Depending on size and desired results of the facility, the UV system can be designed to handle the full flow or a side stream. In order to correctly size the system, the following needs to be determined:

- What is the flow rate in gpm?
- How much water is contained in the entire loop?
- How many times per day does the system re-circulate?

Generally, a 10-percent side-stream system is designed. This assumes that the water will be turned over every four to five hours. Since the water will be re-circulated, it will have multiple passes in front of the UV on a given day. The integration of the UV/filtration will significantly reduce the amount of biocides required.

The system should be comprised of the following:

- Stainless steel UV system;
- Manual or automatic quartz cleaning system;
- Run time meter (indicates when to change lamps); and
- 40 to 50 micron filter (sand, bag or cartridge).

The above can be installed in the loop and results can be seen immediately.

Conclusion

By integrating a combination UV disinfection and mechanical filtration system, the facility can significantly reduce the amount of chemicals required (a small amount of chemicals is required to prevent growth on the sides of the piping as well as in the equipment) and the costs associated with purchasing and storing them.

In addition, this will create a safer work environment and allow the facility to operate as a "green" company. WQP

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