Filters, Water & Instrumentation, Inc.
Cooling Tower Water Conservation

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You get double advantage from properly maintaining your cooling tower. You not only save water but you also save energy by maintaining a more energy efficient cooling tower system.

It has been estimated that well over 90% of the water used by industry is used in cooling towers.

Cooling water is subject to one of the fundamentals of water treatment – evaporative cycles. When you evaporate water, you leave behind the Dissolved Minerals that were in the water initially. In that way as you evaporate and introduce water to a cooling tower system, you are building up the contaminants in the system. As the cooling system becomes more concentrated, we have the common term of cycles of concentration in the tower. The cycles simply refer to the number of times the incoming contaminant have been concentrated. If you have a system with 100 parts of incoming contamination and you concentrate it 3 times, you have 3 cycles or 300 parts of contaminants.

Cooling Tower Sidestream Bag Filter

Each system is different because the incoming contaminants are different. Each constituent of the incoming contamination has its own cycle before it can cause a solubility issue. The trick with the blow-down is to keep any constituent below its solubility level. In some towers it may be iron, in another it may be sulfates. Usually, one of the incoming constituents controls the blow-down level. Whichever constituent is seen to cause the problem first, governs the maximum cycle you can maintain in the tower.

Whoever maintains the tower has an interest in keeping the tower free of contamination so the heat transfer required can be maintained at an economical energy level. Because it's easier to maintain these solubility levels below their thresholds with increased blow-down, maintaining the tower can waste water. It's easier to be defensive and blow-down more water than is required. In addition, since chemicals are maintained at levels in the system to keep the tower water from precipitating, when you blow-down more water than you need, you are also wasting chemicals.

There are many people touting super increased concentration ratios and very low blow-down with some exotic, some simple and sometimes esoteric treatment methods. If there were reliable solutions to tower water maintenance with other than addition of chemicals, they would be used throughout industry. Cooling water treatment still uses addition of chemicals in most applications. There is no way around it.

Caveat: If you consider the consequences of not enough blow-down, you need to exercise care in reducing blow-down. If you precipitate solids on heat transfer surfaces, you have very difficult cleaning procedures. The cleaning must be done with some fairly nasty chemicals and they cause considerable disruption of plant operations. This is always the caveat when reducing blow-down.

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The water used in cooling towers is used as blow-down and evaporation. Evaporation is inevitable as the evaporative process is what provides the cooling effect.

The item most people focus on is blow-down. Blow-down serves the useful function of removing water with concentrated dissolved minerals before the dissolved minerals have a chance to concentrate and perhaps precipitate out on the heat transfer surfaces.

In addition, and less likely these days, blow-down removes accumulated suspended solids from the tower water which can ultimately settle out and cause blockages in the cooling loops during recirculation of the water through the cooling system. We say unlikely these days because most people with an appreciable size cooling tower system have installed sidestream filters which remove the suspended solids.

If you have not installed a sidestream filter and have kept it maintained and running properly, then you should install one and/or fix the one that you have. For any cooling water system of reasonable size, you should have some kind of filtration.

If you want to save water in tower treatment, you focus on the blow-down. The caveat above noted, nonetheless, there is more water wasted in excessive blow-down that any other industrial process.

First, have whoever maintains your tower explain the blow-down rationale. What incoming constituent or constituents govern the rationale. What item causes the blow-down regime. Frequently it's something that was developed years ago and is now just considered the safe way to do it.

Which of the minerals or other contaminants govern the blow-down percentage. This requires chemical analysis of the source water first. In addition, a blow-down controller which senses conductivity or TDS makes this automatic. Keeping score or determining how much make-up water and blow-down water helps. In conjunction with degree days, this will help you keep track of your tower efficiency.

None of this is easy. It takes guts. Someone has to want to save the water and the chemicals. Reducing blow-down and saving cooling tower water is difficult but without question, has the most potential for reducing water use in industry. The precipitation caveat aside, the main potential for water conservation in industry is in the artsy, arcane, archaic, and mysterious world of cooling water treatment. You can also save chemicals, and make your systems more energy efficient.

Do you need any other reasons to work in this area?

Take a look at a quick sidestream design schematic on our website for a UV and filter Cooling Tower Water Conservation Design. You can also take a look at our Website Pages for Cooling Water.

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