Virtual Vacuum Cleaner Clears Up Fouling

By Ed Sullivan

Cooling towers, an effective and common means for industrial process heat extraction, are not closed-loop systems. As a result, they behave like virtual vacuum cleaners for air and waterborne particulate that can eventually foul valuable downstream equipment, such as spray nozzles, welding operations, chillers, heat exchangers and small-bore piping in cooling circuits.

In fact, many plants must shut down cooling water systems several times per year to clean the cooling tower and downstream equipment, which is both time-consuming and expensive.

Although some basic solutions are available, including rudimentary water strainers, side-stream filtration (which involves filtering a small percentage of the total water volume) and point-of-use filters (which are intended for specific critical equipment), the relative insurance of full-stream filtration has emerged, in order to protect all downstream equipment, as the new standard for cooling tower water systems.

“A cooling tower will suck in a lot of air from the environment,” says John Flaherty, president of Delta Cooling Towers Inc. [1] “Any foreign material or elements in the air can easily get sucked into the tower, and a portion of that will either get dissolved into the water or remain suspended in the water.”

Water flowing through cooling towers can be contaminated from a number of sources, including ambient air, makeup water sources, metal cooling tower corrosion and residue picked up from processes. Airborne contaminants can encompass leaves, paper, debris and other pollution.

“A cooling tower works through evaporation, so you’re continuously making up whatever cooling system water has been evaporated,” Flaherty explains. “Many plants use city water, which is comparatively clean. But if you are using lake, river or runoff water, you will have to address problems of suspended and dissolved matter that can damage downstream equipment or make it less efficient.”

The introduction of more efficient technology for cooling tower water filtration actually dates back to the 1960s when R.P. Adams [2] launched the automatic multi-element, self-cleaning strainer. According to the company, this design provides an alternative to sand filters, centrifugal separators and basket-type strainers. Unlike these designs, R.P.’s self-cleaning strainer can provide continuous removal of suspended solids down to 25 microns.

While multi-element strainers may be used in a side-stream application, full-stream configuration is typically recommended as it provides complete continuous water

filtration. Unlike side-stream filters, which are some times used alongside of cooling towers, the full-stream use of a multi-element strainer enables cooling systems to remain indefinitely online because it backwashes elements in sequence, one at a time. Therefore, all of the remaining elements are available for continuous straining. With such full-flow straining capabilities, plant equipment is afforded positive protection at all times — the optimum situation.

Conversely, due to limitations in straining area, other strainer designs and point-of-use filters can become clogged quickly. When that occurs, cleaning, media replacement or backwashing is necessary, thereby adversely affecting productivity, as well as maintenance costs. If maintenance is not performed punctually, spray nozzles, heat exchangers and other production equipment can become fouled and less effective, or even damaged.

Another significant feature of the multi-element design is the backwash mechanism. With automatic basket strainers, for example, the backwash mechanism comes in close or direct contact with the straining media. This can be problematic because large suspended solids (often encountered in raw water) can become lodged between the straining media and the backwash arm. The result is damage and/or rupture of the straining media, perhaps compromising downstream equipment.

Instead, the multi-element design implements a tube sheet to separate the straining media from the backwash mechanism. This prevents the backwash mechanism from coming into direct contact with the media and eliminates the possibility of damage to the elements, resulting in reduced maintenance and downtime. When considering strainer technology for a water system, continuous full-stream filtration furnishes the most comprehensive cooling tower protection, as well as all downstream equipment and piping.

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