Many Happy Returns

This soft drink bottling facility saved so much water by switching to automatic self-cleaning filters that the local utility thought the company had shut down an entire bottling line.

By Jim Lauria

Water efficiency is a growing issue of corporate responsibility—to neighbors, other stakeholders and shareholders. The good news is that in addition to reducing the costs directly associated with water, improving water efficiency also improves the overall environmental footprint of a facility.

Improving industrial water efficiency

In turn, improving the environmental footprint—achieving a return on environment (ROE)—also contributes to a healthy return on investment (ROI). Industrial water falls into a number of categories, each of which offers its own challenges and opportunities.

Ingredient Water

Ingredient water is used directly in the actual formulation of a product. It is the water in a can of soda or a bucket of paint. Ingredient water is often the most highly processed and treated water in the system, so improving its environmental footprint generally comes from making the treatment more efficient and ecologically friendly. Using waste heat to raise the temperature of ingredient water is a straightforward example. So is selecting water treatment technologies that minimize the use of chemicals, reduce or eliminate the need to dispose of cartridges or other consumables and minimize the amount of backflush water produced.

Amiad Filtration Systems helped one soft drink bottler in the U.S. accomplish precisely those goals. Of course, the ingredient water needed to be treated to extremely rigorous standards for taste, quality and safety. But the company's original process—settling tanks; 2-micron ultrafiltration (UF) membranes; and a formula of hydrated lime, sodium bicarbonate and ferric sulfate—was slow and inefficient.

When the company decided to add a new bottling line, it replaced its old filtration system with four Amiad Automatic Micro Fiber (AMF) filters followed by activated carbon and UV disinfection. Inside the AMF filter is a series of plastic cores wound tightly with polyester microfiber to create a filter capable of delivering filtration at the 20-, 10-, 7-, 3- or 2-micron level. To clean the cassettes, a high-pressure jet of water is directed through the fibers and deflected off of the specially designed core, dislodging the trapped particles.

The manager of the bottling plant reported that the new system saved $125,000 per year in chemicals, plus the cost and concerns surrounding their handling. He also noted with amusement that the local water utility representative asked him whether he had shut down a line. Because the new filtration system was so efficient in its self-cleaning process, the plant's water use had dropped significantly even though they had actually added a high-speed bottling line. That efficiency reduced not only the amount of water the plant had to purchase, but also the amount it had to pay the local utility to treat as wastewater.

Service Water

Service water is used in pumps, seals, cleaning and other processes. This category represents a significant amount of water and a significant opportunity for improving efficiency through reuse and recycling.

Many facilities across a wide array of industries use automatic self-cleaning screen filters to remove sediment from service water. Amiad's self-cleaning technology elegantly employs simple physics. When a pressure differential of 0.5 bar (7 psi) is reached between the clean and dirty sides of the screen, a cleaning valve opens to the atmosphere. The differential causes water to flow back through the screen through nozzles that draw in water 1 sq in. at a time, pulling filter cake off the screen and discharging it

Improving filtration for cooling water represents a tremendous opportunity to reduce energy, chemical and water use.

Amiad's scanning nozzles focus backflush on 1 sq in. of screen at a time, making backflush more effective and water efficient.

through the cleaning valve. The suction nozzles rotate in a spiral pattern to clean the entire surface of the screen in a matter of seconds without interrupting the filtration process.

The Amiad system uses 75% less backflush water than sand media filters do, making the process extremely water efficient. Because there are no chemicals, no cartridges to dispose of and only enough energy demand to run a small scanner motor, it has an extremely low environmental footprint—and, by allowing service water to be reused again and again, it lowers the environmental footprint of the whole operation.

Cooling Water

Cooling water offers the greatest opportunity for reducing the environmental footprint of most industrial facilities. Cooling towers are remarkably efficient collectors of debris, from leaves and insects to fine sediment. The debris can have a dramatic impact on the efficiency of heat exchange in the system.

In fact, according to the "Carrier System Design Manual," a fouling layer of just 0.001 in. on a condenser surface can increase overall energy consumption by 10%. Plugging in condensers reduces the surface area available for heat exchange, lowering efficiency, and can also increase pumping costs by restricting flow.

Sediment in cooling systems can accelerate wear in HVAC seals, pumps and jackets. It can also increase corrosion by directly contacting metal components, and indirectly by shielding those components from corrosion inhibitors and oxidants. Finally, that sediment can offer a beachhead and breeding ground for bacteria that can create biofouling and pose a health hazard to workers.

Keeping cooling water clean is a significant challenge. Frequent blowdown, or draining and replacement, of dirty water is common in many operations. But the blowdown process eliminates more than just sediment and water. It also dumps costly biocides, corrosion inhibitors and anti-scaling agents.

Amiad automatic self-cleaning screen filters are widely employed to treat cooling tower water worldwide. In one U.S. manufacturing facility for high-tech components, the maintenance manager said replacing a hydrocyclone and bag filter system in his cooling tower system with an Amiad automatic self-cleaning screen filter eliminated one to two hours of daily labor that his crew used to spend replacing bags and maintaining cooling tower pans and chillers. Today, they simply do a quarterly clean-out and maintain the screen filter's seals every couple of years.

The maintenance manager figures his company achieved ROI in just over one year, faster than expected. With the savings of labor, disposal costs and reduced blowdown, his ROE is similarly impressive.

LEED Scorecard

A growing number of industrial managers are using LEED—the U.S. Green Building Council's Leadership in Energy and Environmental Design—certification program as a scorecard and road map for reducing their environmental footprint. At the start of 2010, there were approximately 4,300 LEED-certified projects. Most were in the commercial and residential sectors. Nearly 60% were new construction projects, but an additional 10% were modifications to existing buildings.

Amiad has been involved in a wide range of LEED projects—from rainwater harvesting in commercial buildings to point-of-entry filtration of drinking water in residential ones—as well as countless industrial water-efficiency projects. Based on that experience, there is no doubt whatsoever that industry can use LEED to benchmark and improve the management of vital resources such as water.

New Sources

LEED projects often spark creative thinking about alternative sources of water, such as captured rainwater. Many industrial facilities have large surfaces such as roofs and parking lots from which they could harvest rainwater for beneficial use. Depending on the intended use of the water, whether it is irrigating landscaping, flushing toilets or supplying the cooling tower, effective water treatment systems can be developed.

Similarly, recycling water within facilities—repurposing service water from one use to the next after appropriate treatment—can relieve strain on water supplies, water treatment and the bottom line. It is all part of looking at the complete water picture and seeing the potential to simultaneously improve both ROI and ROE. *wqp*

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