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FILTRATION TECHNOLOGY HELPS REDUCE ENVIRONMENTAL FOOTPRINT

Properly designed filtration systems can reduce energy and water consumption, minimizing the environmental footprint of a variety of industrial and municipal water facilities.

Competition for clean water among residential, industrial and agricultural users is growing more intense as users are tapping into the same sources of water. Improving water use efficiency is a vital strategy for claiming a share of the dwindling water supply and making it work for larger applications. Water efficiency also ties directly to energy efficiency, which is growing significantly more important as fuel prices skyrocket.

Efficient reduction, re-use and recycling of water can have a significant impact on pumping, treatment, heating and cooling costs – all directly linked to energy consumption. In turn, reduced energy usage lowers an operation's carbon footprint. All of these elements fall under the umbrella of a water treatment facility's "environmental footprint."

Environmental footprint is more than just another metric. It represents a direct pull on the bottom line. It also is a public relations factor that can have a major impact on the viability of a business. Many people, especially in water-limited areas – ranging from Kerala, India to the American West – have loudly objected to having water-intensive companies or farms moving into their neighborhoods. A company with a good track record of water efficiency may be able to persevere and succeed where companies viewed as wasteful may find themselves on the losing end of political, zoning and PR battles.

Of course, economic sustainability is a key benefit of improving the environmental footprint. Disposal of wastewater or back-flush water is often a significant cost, either for disposal itself or for compliance with discharge regulations. So is the disposal of consumables such as cartridges or bags used in some filtration systems, and the use of chemicals to clean or maintain many systems.

A more subtle component of a facility's environmental footprint is its physical footprint. With the increasing prices of raw materials, minimizing the amount of concrete, steel and plumbing necessary to build a filtration system can lower costs substantially and reduce the amount of resources committed to an installation.

As a result, several key elements contribute to optimizing a water handling system's environmental footprint, including:

- Decreasing water treatment chemicals;
- Using a bare minimum of backwash water;
- Minimizing pumping and pressurization costs;
- Reducing footprint – in size, weight and materials.

Clean Technology

Highly efficient automatic self-cleaning filtration systems offer options that can help reduce the environmental footprint of many water treatment operations. Amiad Filtration Systems has engineered two automatic self-cleaning technologies – screen filters and micro-fiber thread filters.

In the Amiad automatic self cleaning screen filters, a cleaning cycle is initiated when sediments build up on the filter screen, creating a pressure differential between the inside surface and outside surface of the filter. When the differential reaches 7 psi, the system opens an exhaust valve connected to a suction scanner, a hollow 316 stainless steel tube tipped with nozzles just millimeters from the screen surface.

Opening the exhaust valve to atmospheric pressure causes water to flow in a high-velocity stream backwards across the screen into the nozzles, carrying the filter cake with it. The nozzles concentrate the suction effect on less than one square inch of the screen at a time, creating a powerful, highly effective cleaning force called "focused back flushing." The suction scanner travels down the screen in a spiral pattern at a fixed speed, reaching 100% of the screen surface in a 25-to-40-second stroke.

The focused back-flush operation is only conducted when needed, and utilizes less than one percent of the flow water – less than any other automatic self-cleaning technology and just a fraction of the water required to backwash a sand media system.

In Amiad's new Automatic Micro-Fiber (AMF) filter, a pressure differential across a dense web of polyester micro-fiber threads triggers a high-pressure spray that bounces off of a specially grooved base plate and is deflected through the fibers to flush the captured particles from the system. With filtration degrees down to 2 microns, the AMF is designed for drinking water and beverage production, protecting reverse osmosis membranes, and wastewater filtration.

In both cases, the integrity of the filtration system is maintained at all times, which is vital.

Even the most effective filters lose their edge if they must be brought on- and off-line frequently. Suspending and re-suspending media, removing cartridges, or torn bags and improperly seated cartridges can create problems downstream with carryover of particles into the system the filter is supposed to protect. The resulting damage to equipment or need to use additional water and/or chemicals to clean up the results of those accidental releases can quickly add cost to operating the water treatment system – and add to its environmental footprint.

In fact, Amiad's automatic self-cleaning screen filters backwash while continuing to filter flow water. Construction also plays an important role in maintaining integrity. The finest level of each of Amiad's multi-layer screen assemblies is constructed in a square weave pattern. The 600-mesh square weave in the 10-micron screen, for instance, is significantly less prone to distortion or separation than 1:2.5 or 1:5 rectangular weaves, which helps ensure consistent performance throughout the screen's service life.

Multi-Staged Filtration Systems

Developing a solution to a water quality challenge is very similar to making a medical diagnosis. It starts with a thorough exploration of the problem and continues through carefully considering the causes, the contributing factors, and the treatment options. Often, there are alternatives to surgery. And even where surgery or aggressive pharmaceuticals are required, addressing contributing factors and managing the results through other therapies can significantly improve the outcome.

The degree of filtration required and the nature of the particles in the source water – size, composition, deformability and other factors – guide the selection of filtration technologies.

Simple particle removal, such as filtering out sand or silt to protect irrigation systems or industrial service water, may be accomplished efficiently with a single technology. But in many cases, the best solution may well be a multi-staged approach to filtration. Even when the ultimate objective is to achieve filtration down to the molecular level, employing a fine cartridge filter, activated carbon, or reverse-osmosis membranes to strain out particles several microns or more in size is unduly expensive.

One customer that installed a bank of Amiad self-cleaning thread filters in place of its fine cartridge filters in a highly aggressive program to filter very saline brines says that it is saving tens of thousands of dollars per day in cartridge replacement. In just weeks, the company more than covered the cost of this new technology.

Similarly, Amiad is seeing an increase in demand for automatic self-cleaning screen filters at the point of entry of hospitals, hotels and luxury high rises. Most municipal water supplies contain high-quality drinking water, but sediments in aging urban conveyance systems can become re-suspended following maintenance, heavy use, or firefighting activity. The result is highly turbid water that many users find unpalatable – or that quickly clogs cartridges or activated carbon systems. Pre-filtration at the point of entry removes sediment from the start, protecting delicate equipment or delicate sensibilities, with no chemicals, minimal maintenance needs and highly efficient back-flush operations.

Conclusion

Drinking water standards demand sophisticated RO or ultra-filtration technologies, and the growing interest in desalination will continue the growth of molecular-level filtration. Industrial users, too, increasingly need highly filtered water to create pure food and beverages, as well as products with ever-tighter tolerances, such as sensitive electronics parts.

Taking that capacity to filter water a step further, many industrial water users are exploring ways to take already-heated-or-cooled process water and re-purpose it for some other use on the line, whether for thermal transfer, primary wash water, service water, or another task. As the links that tie together water efficiency, energy efficiency and industrial sustainability grow tighter, the environmental footprint of the operation – including its water treatment process – will be scrutinized in the future.

Every BTU that doesn't have to be expended in heating water, every pump that can be downscaled because of lower system pressure demands, every gallon of water that doesn't have to be released in a back-wash, and every positive relationship with the local community shows up on the triple bottom line – the economic, environmental and social ones. Filtration choices will have an increasing impact on all of those bottom lines.

ABOUT THE AUTHOR

Jim Lauria is Vice President of Sales & Marketing for Amiad Filtration Systems, a manufacturer of clean technology water filtration systems for agricultural, industrial and municipal applications. He has over twenty-five years of experience in liquid/solid separation processes and water treatment. Prior to joining Amiad Jim owned Team Chemistry LLC, a consultancy that focused on developing new business opportunities for clients' water treatment technologies and was president of an $80M filter media company. During that time he provided peer review for the World Health Organization's publication on drinking water treatment and in partnership with a university led a team that pioneered arsenic reduction in drinking water. He holds a Bachelor of Chemical Engineering degree from Manhattan College.