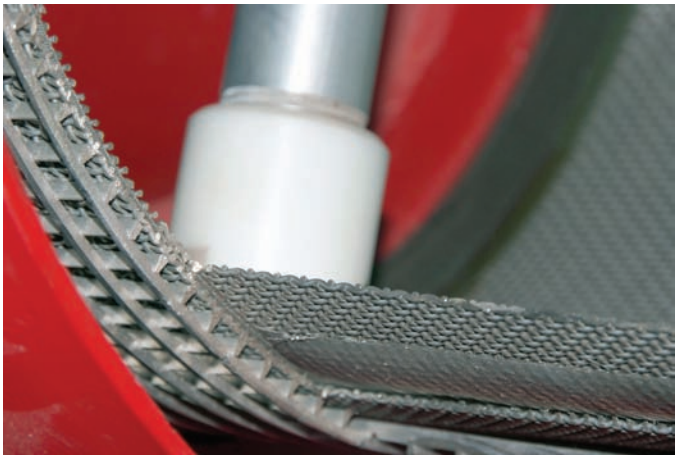
Centralized POE/POU Filtration Technology Offers Environmental Advantages



When a pressure differential is reached, the suction nozzle of this automatic self-cleaning screen filter opens and filter cake is pushed off of the screen by the focused back flush of water into the nozzle.

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Luxury apartment buildings can differentiate themselves with filtration systems that deliver tap water as good as clear as bottled water.

By Jim Lauria

As water delivery infrastructure ages, labor costs rise, and consumers' expectations of water quality continue to be influenced by bottled water, POE filtration in residential and commercial buildings has become increasingly important.

Residents of luxury high-rises and guests at upscale hotels now have little tolerance for off-color water. Maintenance staffs are stretched thin enough at most residential and commercial sites without having to clean hundreds or thousands of sink aerators, showerheads and other fixtures clogged with sediment. And in buildings such as hospitals and laboratories, suspended solids can have disastrous effects on equipment, turning dislodged pipe sediments into a life-or-death challenge.

It's no longer enough to differentiate a luxury building with a filtration system that can deliver crystal-clear water to tenants and guests. Filtration systems are now expected to operate with a reduced environmental footprint to help position buildings as environmentally conscious projects. In short, developers are looking to filtration with an eye not only toward their return on investment (ROI), but also toward their return on environment (ROE).

Compact filtration systems are dramatically reducing energy costs in heating, ventilation and air conditioning (HVAC) systems, allowing progressive engineers to design rain-water capture systems that use roof water to flush toilets—both significant contributors to the green qualities of a project. (This isn't likely to go away anytime soon, as evidenced by rain-water harvesting ordinances in Tucson, AZ and Santa Fe County, NM, as well as the interest those laws are generating in other communities.)

In the newest development for green water technologies, the US Green Building Council (USGBC) has awarded a LEED Innovation in Design credit to a project that integrates a central POE-filtration system with individual POU systems (one per kitchen) of a 1,200-unit high-rise. The goal is to ensure that every sink delivers tap water as good as, or better than, bottled water, eliminating the consumption of nearly 200,000 bottles of water in that building alone.

Infrastructure issues

New York City has some of the world's best tap water, collected in reservoirs upstate and delivered through hundreds of miles of aqueducts and mains to more than eight million residents. But the delivery infrastructure is aging, and more than a century of sediment and scale buildup in the system's pipes are taking a toll on quality by the time the water reaches the city's sinks and showerheads.

The problem is more than aging infrastructure, however. Manganese and iron, originating in sediments in the reservoir beds, oxidize and settle out of solution as water enters buildings, discoloring the water and creating particles that can collect in pipes and fixtures.

Ironically, it is older buildings that have enough texture on the insides of their pipes from years of scale and sediment accumulation to capture some of the precipitating metals. Newer buildings, plumbed with copper piping that resists corrosion and scaling, can transmit the full sediment load right to the tenants—not a pretty picture.

To make matters worse, repairing or upgrading old mains dislodges sediments from the system and opens pipes to contaminants, like dust and soil. Both can load water systems with debris of all sizes. With stimulus funds pushing infrastructure improvements around the country, we can expect nearly constant challenges to emerge from the nation's mains.

With a growing load of sediment flowing into buildings, and clean pipes in new construction likely to deliver it with remarkable efficiency, POE filtration is a highly efficient way

Requiring minimal power and less than one percent of the total flow for back flush, this automatic self-cleaning screen filter captures sediment and scale at the water supply's point of entry, before it becomes a quality or maintenance problem upstairs.

Screen filters operating at the 10-micron level at the domestic water supply's point of entry can triple the life of 0.2-micron point-of-use filters in individual apartments.

for building developers and managers to protect extensive plumbing systems and improve water quality. It doesn't take much calculating to realize that sending maintenance staff to clean out the vast number of sink aerators, showerheads and flushometers in a building with hundreds of units can quickly eclipse the cost of a top-quality filtration system.

Residential buildings go green

High-capacity, automatic self-cleaning screen filters safeguard the point of entry of more than 50 buildings—living quarters for 50,000 to 100,000 New Yorkers—that have recently opened or are nearing completion in New York City. Those installations read like *The New York Times*' classified listings for the most desirable properties in the city: 15 Central Park West, Beekman Tower, Silver Towers and The Helena, the LEED-Gold property that was New York City's first large-scale building to feature universal POE/POU filtration.

The automatic screen-filtration technology at the domestic water supply's point of entry of these buildings captures more than 98 percent of particulates, 10 microns and above. As solids collect on the screen, they create an increasing pressure differential between filtered and unfiltered streams. At a designated threshold, an outlet valve opens to outside pressure. Water rushes to the outlet valve at 50 feet per second through suction nozzles, focusing the force of the back-flush water to pull filter cake off the screen. The nozzles are arrayed on a scanner, which rotates in a spiral pattern to ensure that the entire screen is cleaned during the back-flush cycle, which takes approximately 20 seconds.

The efficiency of the focused back-flush system ensures that very little power is consumed—just enough to operate a small motor to turn the scanner—and less than one percent of the flow is required for back flush. There are no chemicals or replaceable filtration media used. Moreover, the filters are compact, easily stacked on skids in utility rooms in just a fraction of the space required to accommodate sand-media filters.

The POE/POU system follows the screen-filtration step with a POU filter at every kitchen sink in the building. The system (designed by Better Waters of New York City for several new developments) marries a pharmaceutical-grade membrane with carbon media to deliver filtration down to 0.2 micron, fine enough to deliver a 99.99 percent reduction in waterborne bacteria and cysts, while supporting a flow rate greater than two gallons per minute (7.57 L/m). The automatic self-cleaning screen filter at the POE protects the POU filters from coarse particulates, tripling their functional life.

A project developer proposed the POE/POU-system plan for a LEED Innovation point from the USGBC for its 1,200-unit building under development. The council reviewed and subsequently issued a CIR (Credit Interpretations and Rulings) good for one LEED point under the Innovation in Design section.

The essence of the system is to deliver tap water as good as, or better than, bottled water—which, they calculate, will remove an estimated 174,825 bottles every year from the waste stream of the building's residents. That's not just reducing trash. It also represents an opportunity to eliminate the consumption of a tremendous amount of petroleum, used in the manufacturing, transportation and removal of all those bottles.

"Yet that in itself is not enough to meet the USGBC requirement, which is an award not for aesthetics but for a genuinely workable method of virtually eliminating bottled water," said Matt Kaye of Better Waters. "We have to be able to deliver high enough flow rates and longevity to create something truly sustainable. The proven reliability of a green technology in actual, real-world conditions is, I believe, an essential reason why this specific combination was approved."

Other approaches have been suggested for reducing the environmental footprint of point of entry filtration, including hydraulic or pneumatic self-cleaning systems. (In fact, a hydraulic self-cleaning, suction-scanner system is widely used in agricultural and industrial water treatment applications where power is not available or portability is desired.) But air or water power on domestic water systems is just not enough to drive water through the extremely fine screens required for removing particles down to 10 microns in size.

Crowd pleasers

Just uptown of the residential high-rises with the POE/POU systems, is the new Yankee Stadium, site of one of the largest point of entry, potable water filtration systems in the nation. Eight automatic, self-cleaning screen systems are arrayed in parallel to filter the stadium's 2,000-gpm (7,570 L/m) domestic water demand at its point of entry, with a master control panel continually monitoring the performance of each one.

Comments from a stadium engineer reveal an unexpected benefit: domestic water filtration helps keep crowds to the end of games. In the old stadium, without filtration, toilet flushometers would often clog with suspended sediments, incapacitating the toilets and causing people to leave the park early.

The Amway Grand Plaza Hotel in Grand Rapids, MI, also improved customer satisfaction by installing a POE filter to

Automatic self-cleaning screen filters require virtually no maintenance and feature a small environmental and physical footprint.

An XB7000 POU filter combines a membrane and activate charcoal for 0.2-micron filtration. It is safeguarded by a screen filtration system at the water supply's point of entry.

remove sediment that was turning its domestic water brown. The problem was especially acute when fire hydrants in the area were run, or the city was working on the 150-year-old mains system.

Prior to installing the automatic, self-cleaning filter, water quality had occasionally gotten so bad that rooms had to go unrented, or guests were refunded their money. In desperation, management entertained a $100,000 (USD) plan to replace all the galvanized pipe in the hotel's 26-story tower with stainless steel pipe. Since the filter went into operation, water has run clear, and managers discarded the pipe-replacement plan.

In fact, the hotel management was so pleased with the results of the POE filtration system that they worked with the Macomb Energy Resource Integration Team (MERIT) and Systecore to design a filtration system for the Amway Grand Plaza's cooling tower. The group selected a similar automatic, self-cleaning filter that dramatically reduced fouling in the cooling tower, improved the performance and cost-effectiveness of the heat exchange system, cut chemical use, and drastically lowered the amount of water used in cleaning the system.

The management of the Amway Grand Hotel found that well-designed filtration systems delivered both ROI and ROE: significant and immediate cost savings, coupled with dramatic reductions in energy, water, chemical use and space.

Trial by fire

A Virginia hospital experienced flushes of precipitated iron oxides and pipe scale any time infrastructure work stirred up sediment in its municipal water delivery system. Cartridge filters were quickly overwhelmed, interrupting the hospital's water supply.

In the worst cases, expensive cartridges required replacement after just minutes of service. Silt and scale that made it through the cartridge system fouled plumbing throughout the building, and maintenance budgets went through the roof as workers cleaned up the mess. The most sensitive equipment in hospitals (like dialysis machines) are protected with fine-cartridge filters, but those filters are prone to almost immediate blinding during a flush of sediment in the water supply, bringing down equipment until the filters can be replaced.

The hospital installed a 10-micron, automatic, self-cleaning screen system upstream of the cartridge filters to reduce sediment load on cartridges throughout the system—from POE to bedside equipment. The system literally underwent trial by fire one night when a three-car fire in the hospital parking garage required firefighters to open several hydrants adjacent to the hospital, stirring up sediment in the mains.

The screen filters were forced to back flush almost constantly for three hours after the hydrants were opened, but they protected the cartridge filter system—in fact, the maintenance manager reported that the cartridges showed no change after the fire. The screens had successfully removed the sediment and protected the hospital's water supply.

Conclusion

Sediment in municipal water supplies will not go away. Infrastructure continues to age and upgrades themselves can stir up trouble. Whether the outcome is a disastrous interruption of service to hospital patients, lost business from unhappy guests, or thousands upon thousands of plastic bottles discarded because residents don't trust their tap water, sediment in domestic water supplies comes at a high cost.

POE filtration can deliver a high return on investment with a great return on environment. Now, a unique combination of automatic, self-cleaning screen filtration at POE with 0.2-micron carbon filters at POU has earned a forward-thinking developer a LEED Innovation in Design credit on a green high-rise in New York City. That trend is expected to continue as POE-filtration is recognized for the outstanding results it delivers in terms of water quality, ROI and ROE.

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 holds a Bachelor of Chemical Engineering Degree from Manhattan College and has over twenty years of global experience as a business executive in the water and process industries. For more information on Amiad filtration technology, visit www.amiadusa.com/technology.asp. For details on the combination POE/POU system recently awarded a LEED point, visit www.betterwaters.com.*

About the products

♦ *The Amiad SAF series is a line of automatic, self-cleaning screen filters that operate with a small physical and environmental footprint. Using minimal power and back-flush water, SAF filters employ pressure differential to clean their screens as needed, without interrupting the filtration cycle. The result is reliable, full-time protection with minimal maintenance, electricity or water required.*

♦ *The 3M XB7000 filter combines a carbon media with a pharmaceutical-grade membrane to deliver filtration down to 0.2 microns. The result is water of a quality and purity that meets or exceeds bottled water standards, and a flow rate that can keep up with tap water demand. Better Waters of New York City developed a POE/POU system combining the Amiad SAF screen filter at POE with the XB7000 filters at every sink in a residential development. Such a system was recently awarded a LEED credit.*