THE CASE OF THE WEEK — WATER & WASTES DIGEST

Efficient Filtration

Efficient filtration helps Colorado town squeeze nearly every drop out of drinking water plant

by Amiad Filtration Systems

On Colorado's crowded Front Range, along the eastern slope of the Rocky Mountains, every drop of water counts—even in facilities that process millions of gallons per day.

Just 25 minutes north of Denver and minutes from Boulder, public works managers in the Town of Erie, Colo., are running to keep up with a population that is expected to double by 2025 and ever-tightening water supplies. Erie's drinking water is drawn from four lakes, and the town works hard to make use of every gallon of its reservoir water.

"Buying raw water is getting to be more and more expensive," said Joe Kleffner, chief water operator for the Town of Erie Water. "Water accounting has become a big issue in the Front Range—it's of the utmost importance to have good records of where every drop of water is going so it can be paid for. It's important for our raw water rights. And we don't want to overwhelm our wastewater treatment plant."

Capacity First

The town's strategy starts with capacity, reinforced by redundancy.

In 2000, the town built the Lynn R. Morgan Water Treatment Plant to replace a 30-year-old, 1-million-gal-per-day (mgd) facility. The new plant came online at a capacity of 4 mgd, and was expanded the following year to 6 mgd, supplied by four reservoirs. A second pipeline system, drawing from Carter Lake, brings the town's total drinking water processing capacity to 9.9 mgd, with a peak capability of more than 12 mgd.

"There's a lot of redundancy built in," Kleffner said. That helps prevent interruptions in service.

The system is also carefully designed to maximize public safety. Dedicated to protecting its customers from *Cryptosporidium* after the disastrous 1993 Milwaukee

outbreak, Erie was among the first municipalities along the Front Range to install a pressure microfiltration (MF) membrane system.

Multi-Stage Filtration

To protect the Memcor/Siemens submerged MF membranes and keep them running optimally, Erie installed a multi-stage process system, including a pretreatment facility—which includes a rapid-mix, flocculation and plate settling basin for exceptional capture of algae from the local reservoirs—followed by the new submerged PVDF membrane filtration system.

The filter reduces water, energy and chemical use.

Summer algal blooms can drive turbidity in incoming water as high as 50 NTUs, Kleffner noted. Water leaving the pretreatment facility is less than 2 NTUs during the worst turbidity spikes and is less than 1 NTU during normal operations, he said.

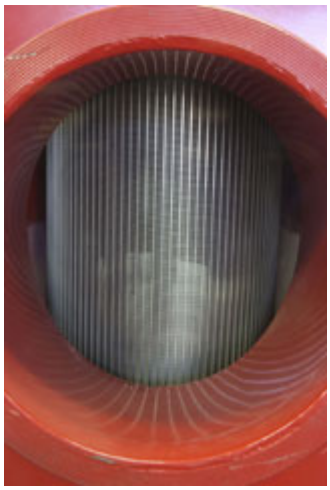
The original 2000 system utilizes the system's three raw water pumps to deliver the clarified water to its own Amiad automatic self-cleaning screen filter, which captures suspended solids down to 300 microns in size, though Kleffner pointed out they have proven versatile enough to handle even the raw incoming water when the clarifier is down.

Multi-stage filtration systems, though they may seem more expensive or complicated at first glance, can be the most efficient way to operate, noted Jim Lauria, vice president of sales and marketing for Amiad Filtration Systems in Oxnard, Calif.

"Using any fine filter to remove large particles is costly and inefficient," Lauria said. "Develop a system that uses the right tool for each step in the process and each of those tools will run more effectively and efficiently. In the long run—and even in the short run—that can really pay off."

Water from high-elevation Carter Lake, which contains less algae, is gravity fed, pressure regulated and directed to another Amiad EBS screen filter with a 500-micron screen before it undergoes microfiltration.

Each Amiad filter contains a four-layer screen constructed of 316L stainless steel. Just millimeters from the inside surface of the screen is a scanner with an array of focused suction nozzles that draw filter cake from the screen during the unit's automatic self-cleaning cycle. When a set pressure differential is reached between the two sides of the screen (typically 7 psi), an outlet valve connected to the suction scanner opens. Water and filter cake are pulled through the suction scanning nozzles at a velocity of 50 ft per second by the pressure differential between operating and atmospheric pressure.



A four-layer screen removes suspended solids.

The scanner operates in a spiral pattern, ensuring that the suction nozzles clean the entire screen in a 20-second backflush cycle. The process takes place without interrupting the operation of the filter, and, just as important, uses less than 1% of the flow.

Optimum Technology

Although the filters can be set to backflush on a timer, Kleffner strongly prefers letting the pressure differential trigger the backflushing process. "We saved water by initiating the pressure differential function and not having them on the timer," he said. "It's really efficient—they're just back flushing a couple of times a day."

Kleffner and his team have been meticulous about exploring water treatment technologies to find the best fit for their needs. They pilot-tested ultrafiltration membranes and evaluated a sand media system before deciding upon their current MF system. For pre-filtration, the decision was simpler.

"We might have spent 15 minutes looking at other ideas, but it came right down to Amiad was the best fit for us," Kleffner said.

In addition to their water efficiency, the filters' automatic self-cleaning feature means that the units require virtually no labor. They only need enough electricity to drive the small motors that guide the suction scanners on their spiral path during back flushing. There is no need for chemicals. And unlike sand media systems, they take up less space.

Periodic maintenance has been simple, Kleffner said. "The service of Inman Interwest's crew has been awesome," he noted. The need for service calls on the

Amiad filters has been minimal over the past nine years, he added. In fact, a team from Inman Interwest in Denver and Amiad's U.S. office in California traveled to Erie to produce a training video on filter maintenance, which has allowed Kleffner and his team to handle their own repairs with ease.

"We've only had to replace a few solenoid valves and a couple of O rings on top," Kleffner said. "We put packing in instead of O rings a couple of years ago, and it's been fine ever since."

Minimal Waste

The most dramatic case for Amiad technology is evident in the tank that captures wastewater from the entire 6-mgd side of the drinking water operation. Kleffner said the whole load rarely tops 10,000 gal per day—less than two-tenths of a percent of the system's total flow.

"Algae and solids are pulled out by a sludge collector at the bottom once a day to go to the wastewater treatment plant," he explained. "That's about 6,000 gal per day. That's all we waste—about 0.1% goes to the wastewater treatment plant. The rest goes back to our local ozonation-treated reservoir for retreatment." That's a story that the Town of Erie can be proud to tell its residents, as well as the water officials who must keep a close eye on the region's precious water supplies.

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