Energy- and Labor-Saving Solutions

Award-winning Wisconsin WWTP adopts green filters

By Joe Zwers

The Stevens Point Wastewater Treatment Plant (WWTP) in Stevens Point, Wis., is located in a university town of 25,000 residents. It keeps the local environment clean by treating an average of 3 million gal of sewage a day before releasing the water into the Wisconsin River. In 2007, the plant received a "Laboratory of the Year" award from the Wisconsin Department of Natural Resources (DNR). As DNR Audit Chemist Camille Johnson stated, not only were no deficiencies found in an evaluation of the lab, but the operators "are very dedicated and make changes when they learn that there is a better way of doing something."

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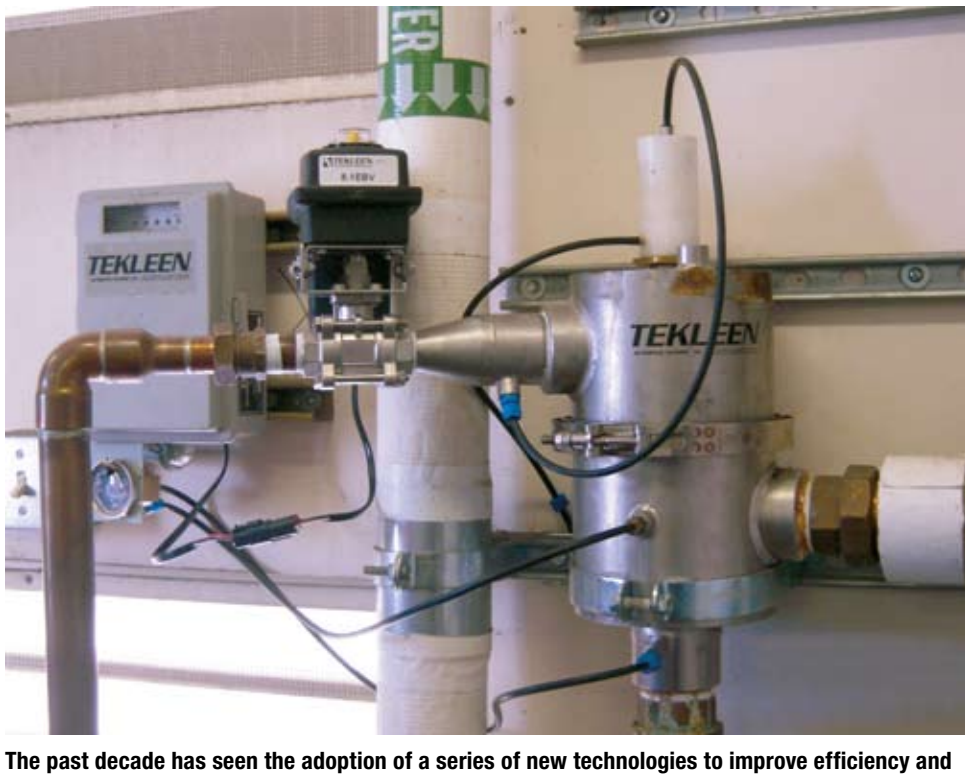

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That willingness to adopt new procedures extends to the rest of the facility. The last decade has seen the adoption of a series of actions to improve efficiency and reduce energy usage. This includes the utilization of Tekleen MTF-1 (1-in. NPT, 100-gal-per-minute [gpm]) filters with 200-micron wedge-wire screens on the wastewater they use to provide heat and cooling for the plant buildings.

"These self-cleaning filters are an energy-efficient, green type of filter," said Eric Niffenegger, plant superintendent. "Instead of using a lot of electricity, they harness the energy from the flow of water going through them to power the cleaning cycle."

70 Years of Improvements

The Stevens Point WWTP dates back to the Great Depression. The city had been dumping its raw sewage into the Wisconsin River, but the state ordered it to begin primary treatment. Rather than complying with the minimum requirements, the city built a secondary treatment facility in 1940. Later upgrades in the 1960s and 1970s included a switch from mechanical aerators to a compressed air system, and the addition of three sludge lagoons, two primary settling tanks and two aeration tanks.

The WWTP was rebuilt in the 1990s to take advantage of newer technologies, including mechanically cleaned bar screens, ultraviolet (UV) disinfection instead of chlorine, and biological phosphorus removal. A grit removal system was added to reduce pump wear, and the sludge storage lagoons were replaced with sludge storage tanks.

Starting in 2003, more emphasis was placed on improving plant efficiency. This led to the installation of grit removal and fine screening equipment, a single 15-hp air compressor replacing two 50-hp compressors, and a 108-bulb self-cleaning system replacing a 672-bulb UV disinfection system.

The efficiency gains extended beyond the water treatment process itself. Heat pumps have been installed in two main buildings that use the treated effluent water for heating and cooling. Although both buildings also have forced air gas heaters, they are only used as a backup.

In February, temperatures drop below 0°F at night and highs are about 20°F. "The wastewater is warmer than the groundwater, so it is a good place to extract heat in the winter," Niffenegger said. "On the buildings where we have the heat pumps, we are not using any natural gas currently."

Lightening the Labor Load

An integral part of the plant's strategy for using effluent water is to incorporate more efficient filters as part of the water treatment program. Tekleen filters incorporate self-cleaning systems that use less water for the rinsing of the screen than traditional backflushing systems. Tekleen's MTF (Minitwist) Series are low/medium-flow-rate filters, fully automatic, self-cleaning water filtration systems. These filters can handle flow rates from 1 to 2,400 gpm with screens as small as 10 microns. The MTF filters use very little water for the cleaning of the screen. They are

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rated to 150 psi and 210°F. The filters are all made from stainless steel material and designed to satisfy a wide variety of industrial and irrigation application requirements.

During filtration, solids build up on the inside of the fine screen, creating a pressure drop at the filter outlet. When a 7-psi differential between the inlet and outlet to the filter is established, the filter controller is triggered to open the flushing valve that will initiate the 4-seconds-long suction of the screen with the use of only 4 gal of water without interrupting the main flow.

Opening the flush valve creates an atmospheric pressure path inside the cleaning mechanism, and the nozzles vacuum the dirt from the inside surface of the screen. A hydraulic motor causes the scanner to rotate in order to cover the entire screen surface in 4 seconds. At that point, the flush valve closes and the cleaning mechanism returns to its starting position. Other than a low control voltage for the differential pressure sensor and actuation of the flushing valve, all motions involved in cleaning the filter are performed using water pressure.

The WWTP selected it first Tekleen product to replace the main filter for all the nonpotable water supplying the seal filters, the fire hydrants and the lawn sprinkling system. The old filter clogged easily and frequently would break down. It became a daily duty to take out the strainers, clean them off and put them back in.

"Even if the cleaning went smoothly each time, just by virtue of having to take the filters out and manually clean them off, you are wearing parts out and they are prone to break," Niffenegger said. "With some of the manual strainers, the housing would actually crack from opening and closing them so much."

The replacements did not experience those problems due to their self-cleaning mechanism. Installing one on the main nonpotable water line eliminated regular manual cleaning and breakages.

"After seeing how well it worked compared to that original strainer, we started thinking about other applications for Tekleen filters," Niffenegger said.

The Stevens Point WWTP deployed another filter on the fine-screen rag auger cleaning operation, where nonpotable water is used to wash the rags off before they go into a dumpster. A third filter went on the heat pump in the office/laboratory building. When the plant added a building to house equipment and offices for the collection system, a self-cleaning filter went on the facility's heat pump.

"In addition to energy savings, we have regained at least a man per day per week by switching to the new filters," Niffenegger said. "[The] filters freed up our staff for other important tasks instead of spending their time cleaning out the filters." WWD

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