Plant Features Better Bubble Technology

New system provides energy efficiency and reduced operation and maintenance expenses.

By Phil Brandenburg

Anyone involved in public works knows that environmental concerns are a top priority these days. That's why old sewage treatment technology simply won't cut it anymore. Today's EPA standards require better wastewater treatment and a cleaner effluent product. These issues led the City of DuQuoin, IL, to invest in a new wastewater treatment facility in 2005.

For more than 40 years the city had utilized a two-phase trickling filter plant. This treatment method was adequate when it was built and it was energy efficient, using only 420,000 KWH per year to treat the city's wastewater, but the effluent it produced was not up to current EPA ammonia nitrate standards. Furthermore, it was designed for a daily capacity of 1.2 mgd, but DuQuoin was averaging more than 1.4 mgd.

Two considerations were at the top of the priority list when we began examining new treatment technologies—energy efficiency and operation and maintenance expenses. With energy expenses constantly on the rise, we were concerned that any of the new technologies capable of meeting EPA standards would be expensive to operate. Clearly, DuQuoin had to have a new wastewater plant, but the city could not build one that would bankrupt the public works budget.

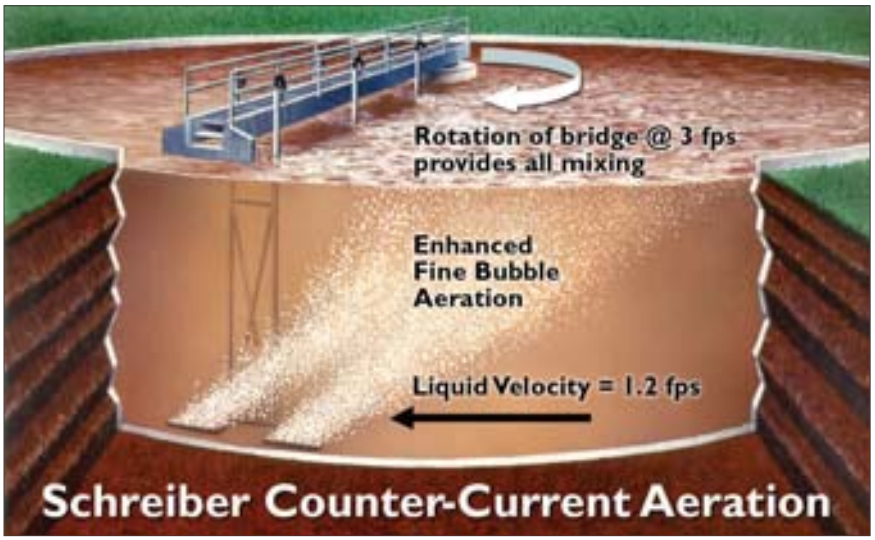
Our research of wastewater treatment technologies began with calls to other cities to discuss their treatment processes. We examined what they were doing and asked lot of questions to get a complete understanding of how other technologies worked, their efficiency, and their operational costs. We read about various treatment methods and saw demonstrations from some companies. After much study and consideration, we chose to build a Schreiber (www.schreiberwater.com) extended air activated sludge system. It was a choice based on both short-term savings and long-term efficiency.

Better Bubbles

High oxygen transfer helps make the Schreiber system more efficient than other activated sludge systems. Schreiber utilizes a fine bubble diffused aeration to achieve both greater oxygen transfer efficiencies and to cultivate a strong biological floc. The company's Counter-Current system utilizes a round tank with a radial bridge from which aeration diffusers are suspended. The bridge and diffusers move continuously around the tank and generate horizontal velocity currents to mix the contents and keep solids suspended. Normally, aeration systems expend considerable energy using air to keep the tank mixed. Due to the independent mixing provided by the Counter-Current system, the blowers can be completely turned off, saving electrical power. The bridge, which is powered by a two-horsepower motor, continues mixing the 1.1 MG tank. Due to the tank being mixed horizontally rather than vertically, the diffused air bubbles remain in the water longer, resulting in increased oxygen transfer and resultant energy savings.

After aeration, the wastewater is sent to a clarification tank where the solids and microorganisms settle out and are removed as sludge and clear water are discharged to the environment. The plant's excess sludge is digested and transported to the city's landfill. In lieu of paying tipping fees to the landfill, services are exchanged; the plant treats their leachate.

With the cost of energy increasing every year, the importance of treatment



The Counter Current Aeration system was applied to the two aerobic digesters. Mixing energy is very low for the digestion process.

Aerial photograph of DuQuoin's wastewater treatment plant shows the relationship of the aeration tanks, clarifiers, and digesters.

efficiency can't be overstated. The Schreiber Counter-Current system was selected for its flexibility and low operating cost, however, energy efficiency has exceeded our expectations. Based on our actual loading at 50 percent of design, operating power requirements were expected to be 840,000 KWH/year. Actual usage has been about 684,000 KWH, which means that at design conditions, the Schreiber system will actually save us another $30,000 a year over and above our expectations.

Thumbs Up

Building the facility and then maintaining it over time was another important cost consideration in our decision. We were able to convert two existing clarifiers into Schreiber aerobic digestors. Meanwhile, we only had to construct two new aeration basins and two new clarifiers. Other technologies we examined would have required three additional treatment basins. This saved a significant amount on construction. We also got excellent technical support from Schreiber, which was extremely helpful to our contractors and engineers. We began with a construction budget of $6 million and we completed the job within budget and on time. We were even able to add a heat trace to the aeration and clarifier basins to alleviate any concerns over ice buildup in the winter.

After a year of operation, the O&M costs have been less than expected and we have had very few technical issues or questions. Whenever a question has come up, we simply call the manufacturer and they respond immediately. We can honestly say that our new treatment plant has earned an enthusiastic thumbs up from everyone involved. It's easy to operate, efficient, and cost effective—the perfect trifecta for any public works department.

Perhaps most important, the effluent quality produced by the plant is excellent. The fecal counts of the water leaving the plant have been so good that we have received a disinfection exemption from the state.

DuQuoin's new wastewater treatment plant will serve our city for decades to come. Every year we will save money on treatment costs and that money will be reinvested in other public works projects. Choosing the Schreiber extended air activated sludge treatment technology was a great decision for DuQuoin that is paying dividends now and into the future. GE

The moving bridge at three ft/second mixes the complete aeration reactor. Only the air needed for the biological process is supplied through fine bubble diffusers.

Mr. Brandenburg is the water reclamation plant superintendent for DuQuoin.