



WATER MAGIC

Making phosphorus in plant effluent disappear

Simplified biological treatment basins reduce nitrogen and phosphorus to low levels.

Just up the road from Fayetteville, where the University of Arkansas is located, and a little south of Bentonville, home of the Wal-Mart Corp., is Springdale, Ark. — a once-small town that's become one of the nation's fastest-growing cities.

Challenges

Springdale was quickly outgrowing its wastewater treatment plant — and it had an added challenge: reducing very high levels of phosphorus in the plant's discharge.

"Water entering the plant contained two to three times the typical levels of phosphorus," says Burns & McDonnell project manager Steve Yonker.

Stop "Recycling Phosphorus"

The high level of phosphorus in water entering the plant was partly due to the substantial poultry industry in northwest Arkansas. The problem was compounded by a solids

treatment process that returned some of the phosphorus removed by earlier treatment steps to the water.

"The plant was actually recycling the phosphorus," Yonker says.

The treated, de-watered solids were applied to agricultural land, a common practice but one that was reaching limits due to the high nutrient load. The disposal method allowed residual phosphorus to re-enter the water supply via runoff, adding to the problem.

Find Time and Space

The state of Oklahoma, downstream on the Illinois River, threatened legal action over water quality issues.

Springdale called on Burns & McDonnell to add plant capacity and solve the phosphorus problem — within the footprint of the existing facility and without putting the plant out of service during construction.

Solutions

Store, Then Treat

When designing the new plant layout, Burns & McDonnell engineers looked for ways to fit the expansion and upgrades into the available space.

"We were able to determine that in certain parts of the plant, minor modifications could increase capacity," says Yonker.

Engineers increased peak flow capacity without having to construct additional clarifier units. That reduced the expansion footprint and the project cost. New pumps, including an influent pump station capable of pumping up to 40 million gallons per day (MGD) of wet weather flow helped solve the problem. The increased pumping capacity would allow Springdale to handle peak flows within the capacity of previously constructed storage basins.

New Aerobic Process and Plant Upgrades

Two 5.5-million-gallon biological treatment basins were designed for a new process that aerates the wastewater and introduces favorable bacteria to remove phosphorus and nitrogen. Sand polishing filters were added to remove even more phosphorus.

Upgrades and improvements were made to nearly every part of the plant, including a new grit removal process, new chemical feed system, expanded laboratory and administration building, and a new, two-story sludge process building with a conveyer system that carries dewatered sludge to a truck-loading bay for disposal.

A new plantwide Supervisory Control and Data Acquisition (SCADA) system used radio controls to incorporate the new processes into the existing process train. It now monitors both the original and new facilities. To keep the plant online during construction, engineers designed the additions in modules so that tie-ins could be accomplished in a matter of hours.

Outcome

Phosphorus Reduced by 95 Percent

The plant expansion and upgrade increased Springdale Water Utilities' capacity from only 12 MGD with a peak of 30 MGD, to 24 MGD with peak capacity of 68 MGD.

And the phosphorus?

"A short time ago, Springdale's plant was seen as a major contributor to the region's phosphorus problem," Yonker says. "All that's changed. The plant now reduces phosphorus levels by 95 percent and is producing among the best water quality of any plant in this part of the country."

The project was also completed under the original budgeted cost.

For more information, contact Steve Yonker, (816) 822-3102.



Tests in lab addition keep an eye on plant performance.



Influent pumping station delivers up to 60 MGD.



Sand filters polish the water.



The finished product — clean water into Spring Creek.