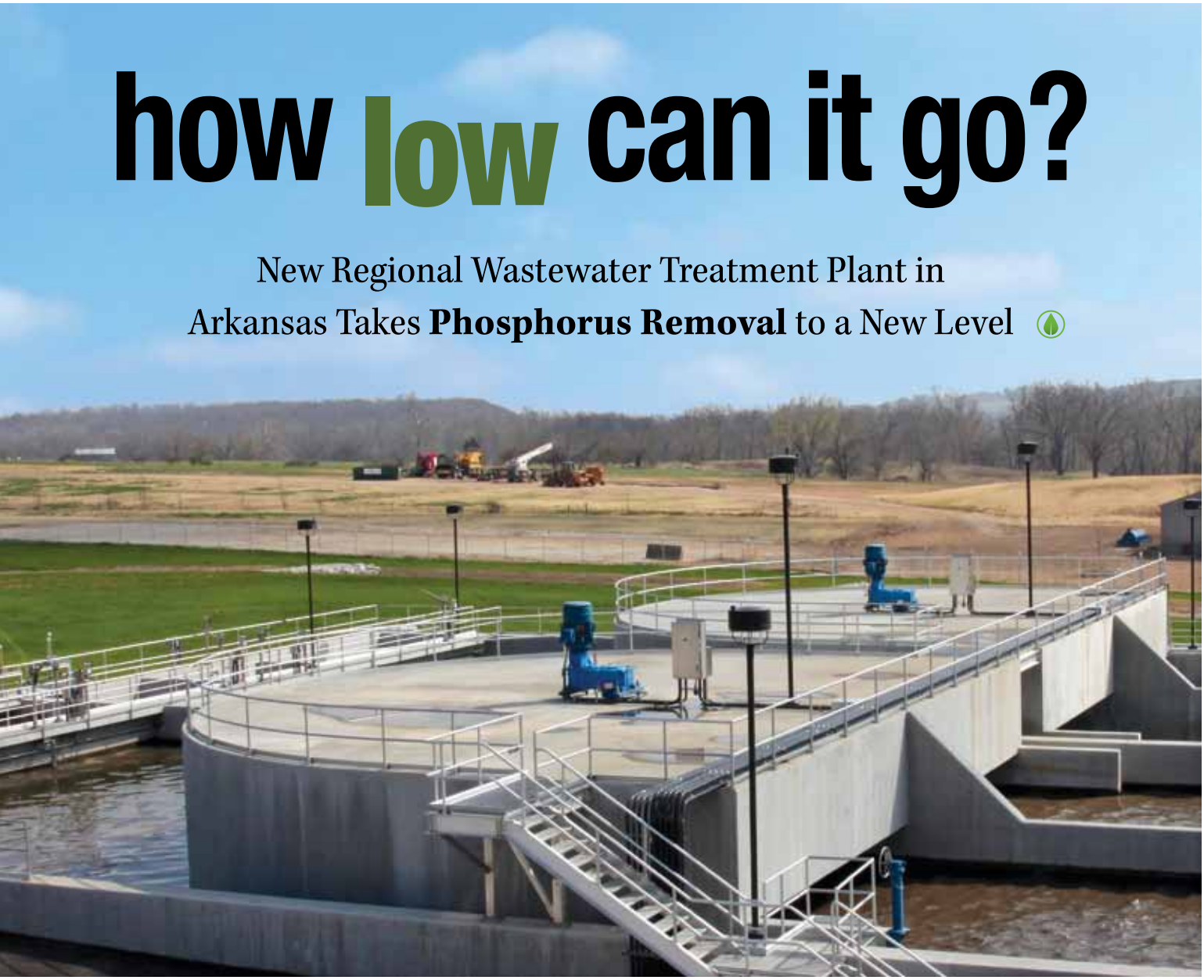
how low can it go?

New Regional Wastewater Treatment Plant in Arkansas Takes **Phosphorus Removal** to a New Level



A three-step activated sludge treatment process with anaerobic, anoxic and aerobic zones removes most of the ammonia, nitrogen and phosphorus from the wastewater along with other conventional pollutants. Aeration equipment is controlled automatically to further reduce energy use by maintaining an optimum level of dissolved oxygen in the aerobic zones.

Background

Northwest Arkansas — corporate home to Walmart and Tyson Foods — is one of the fastest growing regions of the United States. Because of its significant agricultural base, higher-than-normal levels of phosphorus and other nutrients from fertilizers and animal waste have caused regulators to tighten the clamps on discharges of phosphorus from the area's municipal wastewater treatment plants.

With increasing loads on treatment plants and growing concern for the region's water quality, the cities of Rogers and Springdale formed the Northwest Arkansas Conservation Authority (NACA) in 2002. Its initial objective: to develop affordable, regional solutions for the disposal of phosphorus-laden wastewater treatment residuals, or biosolids.

Challenges

Since NACA's formation, the original objective has evolved. Additional cities joined the organization. Among them was Bentonville, Ark., whose wastewater treatment plant had been operating at capacity for several years.

"Our board saw this as an opportunity to build a new regional wastewater treatment plant where Bentonville and our other member cities could send their excess capacity," explains NACA Executive Director John Sampier. In the case of smaller communities that operated septic or packaged sewer facilities, it would be their first and only plant.

"It made more economic sense to operate a large regional facility, rather than upgrade several smaller plants to meet the increasingly stringent requirements for

phosphorus removal," Sampier adds. Bentonville had purchased 500 acres of land that could be used for the project. The challenge was to design a plant that the 10 member cities could affordably access, if and when they wished.

That challenge grew tougher as the project progressed. When applying for a discharge permit, NACA expected the U.S. Environmental Protection Agency (EPA) to follow the state environmental agency's recommendation and set a phosphorus discharge limit of one part per million (ppm), which satisfied earlier interstate water quality agreements.

After the project was bid, however, EPA revised the permit, limiting phosphorus discharge to 100 parts per billion (ppb), beginning in 2012. That's 10 times lower than NACA anticipated and a level few wastewater treatment utilities in the nation have ever been required to meet.

Solution

NACA had selected Burns & McDonnell, in association with USI Consulting Engineers, to provide engineering for a 4 million gallons per day (MGD) initial capacity treatment plant — expandable to 6 MGD — as well as the conveyance system that would eventually connect city collection systems to it. The system capacity will ultimately be expanded to as much as 80 MGD to serve most of Northwest Arkansas.

To meet EPA's revised phosphorus removal criteria, designers had to make significant upgrades to the original design.

"A three-step activated sludge treatment process with anaerobic, anoxic and aerobic zones removes most of the ammonia, nitrogen and phosphorous," explains Steve Yonker, project manager for Burns & McDonnell. "To that we added an advanced, two-stage filtration process coupled with chemical addition to achieve very low levels of effluent phosphorus."

Not only does the new system produce higher quality effluent, it improves the effectiveness of the ultraviolet light disinfection process to destroy pathogens in the wastewater before it is discharged to Osage Creek.

The state-of-the-art phosphorus removal system did, however, add about $4 million to the plant's costs. The overall project stayed within its original budget, and the additional construction work required for the system was accomplished within the project's overall completion date following an expedited schedule to design and obtain construction bids for the phosphorus removal system. Long-term operational costs are also minimized by a supervisory control and data acquisition (SCADA) system that automates many plant operations. "We can operate the entire plant with a staff of five, and we can monitor our operations from our computers at home," Sampier says.

Outcome

After 18 months of construction, the first phase of the plant was completed in December 2010, as were the pipelines linking the plant to its first two customers: Bentonville and Tontitown. Discussions are under way to bring additional customers to the new regional facility. That will drive the timing of the second phase, which will increase capacity by 50 percent.

The system is now performing better than expected, reducing phosphorus levels in effluent to about 60 ppb. "We're well below our current requirement, and are now meeting our objective for 2012," Sampier says. "Burns & McDonnell not only helped us find solutions that comply with EPA permit limits, they've put us on a path for better water quality in the future."

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

A triple-belt filter press combines thickening and dewatering of treatment process residuals in a single step, simplifying operations and greatly reducing the weight and volume of material that ultimately reaches a landfill.

An advanced two-stage filtration process achieves additional phosphorus removal to levels that are among the lowest required of any wastewater treatment plant in the United States.