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# Fresh Perspectives

Using asset management to ensure efficient operations

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# Boyd Point Wastewater Treatment Plant

**Location:** Pine Bluff, Ark.

**Startup date:** 1968

**Service population:** 60,000

**Number of employees:** 50

**Design flow:** 20 mgd (76,000 m<sup>3</sup>/d)

**Average daily flow:** 11 mgd (42,000 m<sup>3</sup>/d)

**Peak daily flow:** 18 mgd (68,000 m<sup>3</sup>/d)

**Annual operating cost:** \$950,000



The Pine Bluff (Ark.) Wastewater Utility (PBWU) operates the largest municipal aerated lagoon wastewater treatment plant in the United States — both in terms of treatment capacity and active lagoon area. Today, the Boyd Point Wastewater Treatment Plant has 484 ac (196 ha) of lagoon surface area and is designed to process 60,000 lb/d (27,000 kg/d) of biochemical oxygen demand (BOD), which is equivalent to serving a population of 353,000 people. However, the plant is designed to serve 60,000 people, as well as several industries. A large poultry processing plant and approximately 12 other industries of various types contribute industrial flow to the plant. In fact, the plant serves two separate sewer systems, one for municipal flow and one primarily for industrial flow.

Throughout its history, Boyd Point has employed a combination of aerated lagoon cells, primary facultative settling ponds, and polishing ponds. Originally constructed in 1968, the plant was modified in 1988 and equipped with high-speed floating aerators in the aerated cells. In 2002, continued growth in the local poultry processing industry resulted in an increased demand and loading to the treatment system.

While the plant still could meet its discharge permit at that point, treatment was borderline, and odors from the lagoons led to frequent citizen complaints. Faced with these problems, as well as keeping the aged

surface aerators in service, led PBWU to modernize the facility.

## Installing Solutions

The plant has two independent treatment trains. Each includes a small but deep aerated pond followed by a larger and shallower facultative pond cell, referred to as the "primary pond." Flow from the primary ponds then passes to polishing ponds shared by both trains. The flow passes through two polishing ponds in series before being discharged to the Arkansas River. Boyd Point is required to produce effluent with no more than 30 mg/L BOD and 90 mg/L total suspended solids. The plant also has a 15-mg/L ammonia limit from May to November.

To improve performance, PBWU in 2004 began a project to revitalize the plant. The utility awarded the \$4.5 million construction project to McGinnis Bros. Construction (Minden, La.), and the work was completed in 2006.

**New aeration system.** To ensure proper treatment, the plant needed an aeration upgrade. After assessing many options, PBWU chose to install fine-bubble aeration using floating laterals and membrane-tube diffusers. This system has the advantage of being cost-effective and could be installed without dewatering the lagoon.

**Aeration blowers.** To provide air to the new aeration system, the plant installed three new 600-hp (450-kW) multistage centrifugal blowers. Each blower is capable of delivering 16,500 ft<sup>3</sup>/min (470 m<sup>3</sup>/min) at 7 lb/in.<sup>2</sup> (48 kPa). Centrifugal blowers were chosen considering capital cost and operating efficiency. A new steel building also was constructed to house the blowers and controls.

**Floating-baffle curtains.** To provide increased treatment efficiency, each of the plant's aerated lagoons



The Pine Bluff (Ark.) Wastewater Utility installed three new blowers at the Boyd Point Wastewater Treatment Plant to support its new fine-bubble aeration system.

JOE DEMPSEY



Floating-baffle curtains, constructed of reinforced rubber, partition the plant's aerated lagoons into complete-mix and partial-mix sections to increase treatment efficiency.

was partitioned using floating-baffle curtains constructed of reinforced rubber. The partitioning created two zones — complete mix and partial mix — in each lagoon. The complete-mix zone contains 20% of the cell volume but receives 50% of the air. The other 50% of the air is distributed across the remaining 80% of the cell volume and operates as a partial-mix zone.

**Multilevel effluent draw-off structure.** To provide discharge options for the operating staff, a mid-depth discharge point was added to the 5-ft-deep (1.5-m-deep) final polishing pond. To accomplish this, a discharge port with a slide gate at mid-depth was added to an existing surface discharge structure.

**Effluent pump station.** PBWU also added a new effluent pump station to enable the plant to discharge during high river stages, when gravity discharge is physically impossible. The new pump station also enables the plant to take advantage of new hydrograph-controlled release (HCR) permit provisions. Under the HCR permit, the plant is permitted to discharge additional permit-compliant water, provided the base flow in the Arkansas River is above the designated threshold of 10,000 ft<sup>3</sup>/s (280 m<sup>3</sup>/s). The HCR permit allows discharge of up to 30 mgd (114,000 m<sup>3</sup>/d) when the river flows

are above the threshold and up to 14 mgd (53,000 m<sup>3</sup>/d) at other times. The effluent pump station has an installed capacity of 20 mgd (76,000 m<sup>3</sup>/d).

The proposed HCR permit allows discharge only if water in the final polishing cell fully complies with the discharge-permit effluent quality limits. Therefore, the effluent pump station normally would not be used unless water in the final polishing cell is fully permit-compliant — about 95% of the time. Otherwise, the flow would be held for additional treatment, which may include disinfection.

**SCADA interface.** To aid the operations staff in monitoring the performance of the upgraded facility, a supervisory control and data acquisition (SCADA) system was installed. From an operating console in the plant operations building, staff members are able to monitor and track operation of the centrifugal blowers and effluent pumps. The SCADA system also incorporates essential control features and provides recordkeeping functions.

## Reaping Results

When the new plant improvements were completed and placed on-line, the operations staff immediately noted an improvement in treatment performance. Odors, which had persisted consistently around the

aerated lagoon cells, disappeared — as did the neighbors' complaints. Additionally, wastewater appearance in the aerated lagoon, which previously was a dark slate color, became lighter and clearer. The appearance of the water in the downstream primary and polishing cells also improved.

With the new diffused aeration system, dissolved oxygen (DO) is present throughout the water column. With the old surface aerators, DO was variable and generally only present near the aerators.

After the upgrade, BOD removal in the aerated pond is higher, too, as would be expected. This, in turn, reduces the additional BOD removal required through natural treatment mechanisms in the downstream primary and polishing ponds.

During various seasons of the year when conditions are conducive, PBWU can operate one blower with sufficient DO levels to meet compliance with its National Pollutant Discharge Elimination System permit. Thus, significant reserve BOD capacity is available, which achieves one of the project's primary goals.

Also, significantly less ammonia is being discharged from the new treatment system, and less cold weather inhibition has been observed. Most of the additional ammonia removal benefits are attributed to the provision of a complete-mix zone in the aerated ponds. Finally, overall treatment costs have been reduced after installation of the more efficient aeration system.

Since startup of the new treatment facilities, no permit excursions have been recorded and Boyd Point plant is among the most modern and efficient aerated lagoon treatment systems in the country. With a BOD removal capacity of 60,000 lb/d (27,000 kg/d), the city of Pine Bluff is now well positioned to attract new industry, and PBWU has achieved its goal of modernizing the nation's largest aerated lagoon treatment plant.