

## Above And Beyond: Oxidation Ditch Plant Expansion Comes With Host Of Benefits

*Process Aeration System Offers Flexibility and Energy Efficiency*

By Greg Harding

The Steep Bank/Flat Bank wastewater treatment plant located in Missouri City, TX was originally designed in 2000 but within several years, the city needed to double the treatment capacities of the facility. The overall progression of the project was unique in itself, well planned and today, the plant is exceeding all permit requirements.

The wastewater treatment plant was designed in 2000 with a plant capacity of 1.5 MGD, utilizing a single ditch with the extended aeration activated sludge process for secondary treatment to facilitate removal of Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS) and Ammonia (NH<sub>4</sub>-N). An expansion followed to increase the plant capacity to 3.0 MGD.

The initial construction included a single ditch with aeration provided by brush rotors. In 2007 the brush rotors were proving insufficient to provide adequate aeration to sustain acceptable residual oxygen levels in the oxidation ditch. Numerous bearing replacements and multiple shaft failures, coupled with time consuming and costly operation and maintenance (O&M) requirements, lead the city to seek alternative solutions to increase aeration in the basin. In 2008, they found the Aire-O<sub>2</sub> Triton<sup>®</sup> process aerator/mixer from Aeration Industries International, located in Chaska, Minnesota.

The process aerator/mixers offered a number of benefits over the existing rotor system reported Scott R. Elmer, P.E., the Assistant City Manager. "The simple installation of the Aire-O<sub>2</sub> Triton aerators/mixers without any additional structural and mechanical installation or modification made the equipment an adequate fit for the failed surface brush rotor aerators," he said.

The installation of the equipment proved to be simple and required only readily available installation equipment. Additionally, the City selected float-mounted units further simplifying the installation process. The units took approximately one to two hours to fully assemble. Finally, they were lifted into the basin and moored in place. The Tritons helped to improve mixing in the basin and successfully raised the residual oxygen to acceptable levels.

*The process aerators allow for power savings.*



Following the success of the interim project, the City looked to address the expanding residential growth they were experiencing. They were tasked with increasing the capacity of plant from 1.5 MGD to 3.0 MGD. All too familiar with the costly repairs and extensive downtime experienced with the brush rotors, the City wanted to avoid installing rotors in the new ditch. Pleased with the ease of installation and reduced O&M of the Tritons, the City again looked to Aeration Industries to propose a solution for the expansion. Aeration Industries proposed the Tri-Oval<sup>®</sup> Oxidation Ditch System for the new ditch, again using the Triton process aerator/mixer technology.

The ditch system offered a number of benefits to the City. As before, structural work was limited and the O&M on the equipment would be minimal compared to the brush rotors. The system offered redundancy and also provided for consistency with the equipment. Spare parts for the process aerator/mixer could be stored on-shelf and the units could be fully disassembled and reassembled in approximately one hour. All of which would virtually eliminate any downtime in the ditch in case of an unexpected mechanical problem.

On the process side, the Triton aerator/mixer offered the ability to operate in aeration and mixing mode or mixing-only mode by turning on or off the regenerative blower, dictated by residual oxygen set points to reduce energy consumption. Dissolved Oxygen (DO) probes located in each



ditch, coupled with a Programmable Logic Controller (PLC) would work together to control the blower operating status. The system could also be adjusted to create anoxic conditions in the future. This offered two distinct benefits including control of filamentous bacteria and denitrification. Anoxic conditions cause strain on the filamentous bacteria helping to minimize sludge bulking issues in the secondary clarifiers.

*The Steep Bank facility added a second ditch, doubling capacity.*

These conditions also incite the denitrification process to remove nitrate from the wastewater. This was not an immediate concern for the City as they are not currently burdened by nitrate effluent limits, but The Tri-Oval system would afford the City the flexibility to address the issue if nitrate removal became a requirement in the future. With minimal installation requirements, low operating costs and ease of maintenance in mind, the City chose to expand the treatment capacity of the plant using the Tri-Oval design.

Like most projects, the Steep Bank facility faced challenges after the initial installation of the new Tri-Oval system. Once the construction was complete and the new process was put on line, the City and operator were quick to realize they were not achieving the desired residual oxygen levels with the new technology in the new ditch. The project engineer worked diligently with the



assistance of Aeration Industries to identify the problem and determine an immediate solution. With time and thorough testing, it was determined that the system was receiving increased loading concentrations in excess of what the system had been originally designed to treat.

Fortunately the selection criteria and process used for the initial improvement would again prove beneficial. Aeration Industries was able to respond quickly and efficiently to offer a solution to address the higher than expected loading conditions. The minimal installation requirements made it easy for the City to work with the contractor to install two additional units in each ditch to supplement the original design and provide the air needed to compensate for the increased loading rate.

The Steep Bank/Flat Bank Wastewater Treatment Plant installed a total of 14 x 37.5 Hp total process aerator/mixers. The plant's effluent BOD is 3 mg/l; TSS 3 mg/l and NH<sub>3</sub> is 0.1, all well below permit limits.

Today, the city officials and the plant operator are satisfied with the performance of their new system. Capital costs associated with the project were minimized because of the limited structural work required. Time, costs and downtime associated with operation and maintenance have been reduced significantly. All of which leave Missouri City with the confidence they can quickly and easily respond to emergency situations while continuing to consistently meet effluent requirements.