Case Study: Du Quoin Wastewater Treatment Plant

The Du Quoin Wastewater Treatment Plant (WWTP) in southern Illinois runs a Schrieber Plant with an average flow of 2.4 million gallons per day. The plant was running into challenges with their digesters due to waste sludge thickening, which resulted in high solids content, which led to poor digester and dewatering performance. Additionally, the facility grappled with odor problems. To combat aeration issues, the plant was using two blowers a digester that was only one-third full, but this led to unnecessary energy consumption and cost inefficiencies.

To address these issues, Du Quoin investigated no-to-low-cost improvements to significantly enhance operational efficiency and sustainability, achieving significant results without significant expenses.

Addressing Aeration and Solids

In the past, to aerate and manage solids Du Quoin WWTP used a gravity belt thickener to waste activated sludge. Once thickened, solids were pumped into the digester, kept at one-third full and used two blowers to aerate that digester. As a result, digester solids were 6% or higher, which affected the fine bubble aeration system’s performance, creating larger bubbles, more difficult mixing, and the lack of fine bubbles caused poor oxygen transfer, as well as moderate odor issues. As a result, the facility experienced inefficient dewatering, evidenced by the belt filter press feeding at a low rate of about 30 gallons per minute, producing heavy sludge. This inefficiency resulted in higher disposal costs due to the denser sludge.

The Du Quoin WWTP needed to try different process changes to reduce energy use and increase dewatering efficiency. To accomplish these improvements, they set goals to eliminate gravity thickening and direct waste straight to the digesters to reduce the solids content to allow them to use both digesters at full capacity, reducing the use of their blowers, and employ decanting for thickening. Through these improvements, the plant hypothesized that thinner solids would result in decreased use of blowers, leading to energy savings and operational efficiency.

Transitioning from Gravity Thickening to Digester Decant

The Du Quoin WWTP moved forward with their goals to enhance operational efficiency and environmental performance through no-to-low-cost improvements. After eliminating gravity thickening and moving to decanting as their thickening process, they noted significant improvements. The digesters at the plant are now fully utilized, with a lighter brown color, indicative of proper treatment and more consistent, even treatment throughout the digester basin.
Because they weren’t filling their digesters completely, they can now use decanting drains, turning off the air to the digesters to conserve aeration energy. While it is a new change in operations, the new decanting process for thickening solids has allowed for the suspension of aeration, conserving energy. Digesters are now using timers to cycle aeration blowers, using only one blower for one hour on and one hour off throughout the day, resulting in only a fourth of the energy use compared to their original process. Furthermore, they achieved improved nitrification and better control of biological issues. Because of these process improvements, sludge handling is much easier in the drying process. The filter press now handles more gallons per minute, producing a drier filter cake, halving polymer use, and reducing waste tonnage for landfill, thereby cutting hauling costs.

The success of Du Quoin WWTP project demonstrates how one key process change can yield significant energy reductions, more efficient operations, and cost reductions. By focusing on strategic, cost-effective operational changes, the facility was able to achieve significant enhancements in efficiency, sustainability, and economic efficiency.

Check for No-Cost and Low-Cost Improvements

Operational costs for wastewater treatments can be substantial, with energy consumption accounting for a significant portion of a facility’s budget annually. However, no-to-low-cost improvements emerge as a vital strategy for facilities striving to enhance their efficiency, sustainability, and financial viability. These improvements are crucial for several reasons:

- **Economic Efficiency:** The improvements enable treatment plants to reduce operational costs, including energy expenses, without the need for substantial capital investments.

- **Environmental Sustainability:** By optimizing processes, these improvements can minimize the environmental impact of wastewater treatment, reducing greenhouse gas emissions and conserving water.

- **Operational Optimization:** Adjustments in operational practices can lead to enhanced treatment efficiency, and better resource management.

The Du Quoin WWTP project illustrates just how much no-to-low-cost changes can yield significant benefits for reducing maintenance, waste and energy costs, and increasing plant operational efficiency. Through careful analysis, strategic planning, and targeted implementation, it is possible to achieve substantial operational and environmental benefits without the need for large-scale financial investments.

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