Water Industry Solution

Aeration Basin Application Solution

Improve Wastewater Treatment Plant Efficiencies and Reduce Energy Costs

Features

- Automatically monitor and control air blowers
- Seamless installation
- Scalable to large or small applications

Benefits

- Reduce operating costs
- Use resources more efficiently
- Reduce energy usage and costs – a wastewater facility in a major metropolitan area saw a 17 percent annual decrease in energy costs

Solution

Meet wastewater permit requirements without overspending. The Rockwell Automation and Endress+Hauser alliance gives plant managers a comprehensive and proven solution for meeting clean-water requirements and minimizing energy expenditures.

Leverage an open control and information system from Rockwell Automation and best-in-class instrumentation from Endress+Hauser to monitor your varying parameters and relay the information to your aeration basin's Programmable Automation Controller (PAC), which automatically operates the blowers at specific speeds and durations.

Endress+Hauser

People for Process Automation

Wastewater treatment plant holding tank.

The Challenges

Wastewater treatment plants consume about 3 percent annually from America's electric grid, according to the federal Environmental Protection Agency. This demand is only anticipated to grow as the global populations increase, and state and federal regulations tighten.

The biggest energy burden within wastewater plants are the large air blowers used in aeration basins. These blowers – which throttle air through millions of gallons of influent wastewater per day – can account for up to 60 percent of a plant's total energy usage.

The blowers help ensure that treated water meets permitted standards, particularly for nitrogen (in the form of ammonium and nitrate). To accomplish this, blowers pump proper amounts of compressed air through the tanks to feed bacteria and support the nitrification process.

Creating the proper aeration environment is a delicate balance – the basins need enough oxygen to keep microorganisms alive, but too much can unnecessarily drive up energy expenditures. Various factors can impact influent volume at any given time, in turn affecting the needed frequency and duration of the blowers. These factors include the weather, time of day, and industrial activities, among others.

From an energy-cost standpoint, the most primitive and expensive way to manage the blowers is manually turning them on and off, based on laboratory tests of the wastewater done by operators at set intervals. Often, blowers can be overused because of the frequent fluctuation of ammonium levels.

Incorporating variable frequency drives (VFDs) adds efficiency to the process by controlling the blowers based on Dissolved Oxygen (DO) measurements in the aeration basin. This helps reduce energy consumption, but still can lead to excessive blower operation because the system is typically set to maintain proper oxygen levels at all times – even when ammonia levels are low and, in turn, oxygen demand is low.

Sensing Savings

A more accurate and efficient option is to measure the most important factors – the ammonium and nitrate levels, combined with DO high and low points – and then control the blowers based on that data. This more precise approach delivers the correct amount of air at the correct basin level, helping ensure efficient removal of solids. Additional variables – such as temperature, pH, airflow rates, water levels, potassium levels and air pressure – also can be measured and utilized so the blowers perform at peak efficiency while meeting permit requirements.

For example, permits often specify pH requirements for treated water, and measuring those levels during the aeration process results in optimal response. Potassium, meanwhile, can interfere with ammonium measurement. Measuring potassium allows for automatic compensation to be made during the process to more accurately measure ammonium levels.

This more sophisticated measurement approach is made easy with the Endress+Hauser aeration control instrumentation package and the Allen-Bradley® programmable automation controller (PAC) from Rockwell Automation. Endress+Hauser instruments monitor varying parameters and relay the information to the basin's PAC, which then automatically operates the blowers at specific speeds and durations.

The Endress+Hauser Liquiline CM442 transmitter and CAS40D sensor with digital Memosens protocol use a single sensor array to monitor all ingredient levels in both the influent and treated water. The Oxymax optical or amperometric dissolved oxygen sensors track dissolved oxygen levels across a range of 0.05 to 20 milligrams per liter to maintain minimum levels (with a standard aeration region operating at about 2 milligrams per liter).

The air-delivery system is monitored by the Endress+Hauser T-Mass T150 thermal mass meter in the blower air line. Meanwhile, the Cerabar S pressure transmitter measures air-line pressure and a Prosonic FMU90 ultrasonic transmitter or Waterpilot FMX21 hydrostatic sensor controls and measures the influent level, ensuring blowers overcome the hydrostatic pressure of the basin to force air into the process.

The instruments work together to support the blowers' operations, and the real-time information dictates the timing and duration of the plant's air blowers to form a fully automated process.

Collaborative Solution

The proven compatibility of Endress+Hauser equipment and Allen-Bradley PACs removes the often painful burden of creating a communication link between incompatible blowers and the PAC during the equipment installation – a process that can take several hours per I/O point.

Endress+Hauser and Rockwell Automation aeration basin solutions are built for compatibility, as well as tested, reviewed and approved together. Leveraging a common EtherNet/IP network, they integrate and operate seamlessly.

The complete instrumentation package also can be integrated into virtually any aeration basin system and retrofitted with older equipment. Because Allen-Bradley PACs are used in the vast majority of wastewater treatment plants, installation is quick.

Endress+Hauser instruments also use digital communications and advanced diagnostics to simplify maintenance and commissioning, while providing plant workers with the latest in condition-monitoring capabilities.

Universal Application

This more efficient, real-time measurement approach can yield major energy savings for treatment plants of all sizes. One example is a wastewater facility in a major metropolitan area that saw a 17 percent annual decrease in energy costs, despite an 18 percent increase in influent flow. The Endress+Hauser and Rockwell Automation solution also is highly scalable, allowing smaller operations to gain efficiencies and reduce energy costs.

This is particularly timely for plants that need to update equipment and instruments because of changes in permits, influent flow increases arising from population and industrial growth, standard wear and tear, and other factors. Municipalities can also take advantage of government programs and grants that help communities reduce energy costs.

Meeting permit requirements without overspending is an ongoing challenge for all wastewater treatment plants, particularly in the era of higher energy costs. The Endress+Hauser and Rockwell Automation alliance gives plant managers a comprehensive and proven solution for meeting clean-water requirements and minimizing energy expenditures.

Why We Partner

Rockwell Automation and Endress+Hauser are committed to helping meet the needs of customers for complete process automation solutions. Drawing from the core competencies of both companies, together we are able to deliver pre-engineered, pre-tested, supported and maintained integrated instrumentation and control and information solutions.

Today we focus our combined efforts around tools for integration, plant-wide advanced diagnostics, and overall helping you manage your process system lifecycle.

Endress+Hauser
People for Process Automation

Rockwell Automation Strategic Alliance

Rockwell Automation and PartnerNetwork™ companies collaborate to help you develop an ongoing approach to plantwide optimization, improve your machine performance and achieve your sustainability objectives.

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Endress+Hauser is trusted by more than 100,000 customers to make their processes safe, efficient and environmentally friendly. We offer a range of measurement products, including level, flow, pressure, temperature, analytical and complete engineered solutions designed to help customers acquire, transmit, control and record process information needed to manage operations in a safe, reliable and profitable manner.

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