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How Air System Audits Can Drive Big Improvements In Wastewater Operations

Industrial manufacturing and processing facilities have long relied on air system performance audits to maximize their compressed air station while minimizing energy consumption. Wastewater plants could significantly benefit from the same approach for aeration blower systems but have been slow to adopt the practice.

The power needed for aeration can drive as much as 60 percent of wastewater treatment energy costs and achieving optimal dissolved oxygen (DO) levels would enhance their overall process. Yet plant managers tend to keep their focus on compliance. In other words, there isn't much incentive to perform a deep dive into operations if the facility is staying out of the eye of regulatory agencies and the equipment seems to be fine while the repair budget hasn't been blown out of proportion.

However, the overall potential operating benefits of an air system performance audit are too big to ignore.

The Root Of The Problem

Most wastewater plant managers face a common problem: their plants are no longer operating under the original design conditions, if they ever were. That's because facilities tend to be designed for processing influent at full capacity with equipment running at its peak. This rarely happens. Most plants operate significantly below their maximum design specifications. So, the question becomes how efficient is the system when partial loads are the norm?

Courtesy of Kaeser Compressors, Inc.

To accurately evaluate an aeration blower performance requires measuring the actual conditions over a set period to generate a baseline. This data shows which units are running, when they are running, and how efficiently this is happening.

A vendor-neutral air system performance audit is done by inserting a flow meter into the municipality's distribution system pipeline. Other measurements that need to be factored into the analysis include inlet and outlet temperature and equipment power consumption. When all this information is examined in the proper context, the result is a complete picture of how much air is being produced and the amount of power that is required. The latter can be directly linked to its actual impact on the total power bill.

This analysis is critical for selecting the appropriate equipment and control strategy when the aeration system needs to be upgraded. The idea is that plant managers cannot manage what they don't measure. Without a baseline of how a system is currently performing, it's nearly impossible to make good design and purchasing decisions.

Moving forward on an aeration upgrade or blower replacement without the analysis will likely result in sizing the system either too large or too small. This leads to excess capital costs and operating costs, including wasted energy, as well as poor biological controls.

However, even if a project isn't on the books now, the analysis can still be helpful to generate baseline data so it is readily available for future needs. The information may also reveal simple improvements that can be made immediately.

A Case Study

Kaeser Compressors, Inc. recently assisted a small plant with aging blowers that wanted to improve its aeration system. The plant was in the midst of upgrading most of its systems and processes and needed an air solution immediately, but also had to account for long-term growth expectations. Kaeser took measurements of the existing system and performed an analysis that included projections for future aeration needs to reach a scalable design.

In the process, the plant switched from using older, centrifugal fixed-speed blowers with no DO control to variable-speed rotary screw blowers with a DO probe. The change dramatically improved the municipality's control over DO levels and is now generating more than $18,000 in annual energy savings, a 60 percent reduction.

While the air system performance audit can be invaluable, there is a reluctance by some wastewater plant operators and consulting engineers to include a blower manufacturer in the evaluation and research. This is based on a misconception they will be steered to that supplier's solution regardless of what the results suggest. The truth is that reputable suppliers will present an unbiased analysis that is brand neutral, based on real data collected from the existing system, and not push a solution that is less than optimal.

Additionally, vendors with extensive experience in aeration system designs can inject important considerations that may not have been on the table. ■