Advanced Technology Increases ROI In New Ecuador Wastewater Plant

Whether an expansion, renovation, or greenfield installation, wastewater treatment plant (WWTP) projects are no simple matter. It often takes years to plan, specify, and begin construction. The many stakeholders involved can have conflicting priorities and varying levels of technical knowledge.

To cap it all off, the design engineer must take a multidisciplinary approach, considering everything from architecture to plumbing. This can make it challenging to ensure that the project is using the ideal technology. In many cases, engineers will settle for using technologies with which they are already familiar. The hope is that by using "tried and true" technology, engineers can avoid risk and focus on delivering a solution that will meet the broader strokes of the design requirements, even if they are not the most ideal.

The danger comes in thinking there is a single technology suitable for all applications. In truth, every plant has its own characteristics and needs. These factors need to be analyzed in order to understand which technology will provide the greatest benefit.

For example, some technologies, while more costly upfront, can offer greater energy efficiency and for most WWTPs this can result in greater cost savings in the long run. That said, in regions where energy costs are relatively affordable, the return on investment (ROI) may not be significant enough to justify energy-efficient technology. Likewise, regions that are struggling to find workers may benefit from easy-to-use, lower-maintenance options that require less training and manpower to run.

How Guayaquil Invested In Cutting-Edge Technology

As the second-largest city in Ecuador, Guayaquil boasts a population of more than 3 million people. The region is rapidly growing, having seen a nearly 50% increase in population over the last 20 years. Knowing this, the public company that oversees the city's WWTPs made plans to build a new Esclusas treatment plant in the southern part of the city. Previously, much of the city's dirty water was being discharged into the river. The new plant was designed to treat up to 3 cubic meters per second, with the ability to increase capacity to 3.5 cubic meters over time.

In addition, the new plant was designed with a secondary treatment system for the purpose of reusing some of the influent for service water. This decision allows the plant to reuse 2% of its water for non-potable purposes, such as cleaning, flushing toilets, and more.

The secondary treatment system uses a dedicated activated sludge system (Figure 1). Activated sludge is a highly effective nutrient-removal process, but it, like many wastewater treatment technologies, is energy-intensive. The

Photo courtesy of Aerzen

Figure 1. A secondary activated sludge system was installed within the Esclusas wastewater treatment plant (WWTP) in order to reuse some of its water for non-potable services, such as cleaning, cooling, and flushing toilets. The decision will reduce water usage by 2% annually. But to make the secondary treatment system cost effective, it was designed to work with energy-efficient turbo blowers.

Photo courtesy of Aerzen

Figure 2. Aerzen's permanent magnet motor means its turbo blowers require minimal maintenance, as it requires no oil and generates no friction to wear down parts. In addition to their energy efficiency, these features further enhance the return on investment (ROI) in the advanced technology.

secondary treatment required the use of two aeration blowers.

Soluciones Aquicolas (SOLUAQUA) was the OEM and engineering firm selected for the project. Knowing the energy needs (and costs) of the activated sludge system, SOLUAQUA turned to Aerzen for help finding the right blowers to ensure the aeration process would be able to achieve the dissolved oxygen (DO) needs at the lowest cost possible. Aerzen recommended its energy-efficient turbo blowers, which require 30% less energy than other blower designs.

Benefits Of Aerzen Turbo Blowers

One of the key benefits of the turbo blowers was its lower operation costs. The secondary treatment process consumes around 9,400 kilowatt-hours per week, which costs more than $122,000 per year. The savings from turbo blowers are estimated to be $36,600 per year.

This isn't the only advantage of the technology. Aerzen's turbo blowers require less maintenance. Other blower technologies require regular oil changes. In addition, bearings and sealings often wear out, which forces operators to stop the machine to replace them.

Aerzen turbo blowers use a permanent magnet motor with air foil bearings (Figure 2). This means the machine requires no oil, produces less friction, and thus has fewer parts that wear out and must be changed. The only operator intervention required is to change air filters, but the machine does not have to stop during this process.

The permanent magnet motor is also capable of much greater speeds than an asynchronous motor and gear speed increaser motor, offering up to 40,000 rpm, compared to 8,000 rpm with other technologies. These are benefits that might not have been realized had SOLUAQUA not advocated for a more advanced technology. While the initial capital investment was greater, plant managers expect an ROI of just over one year. ■