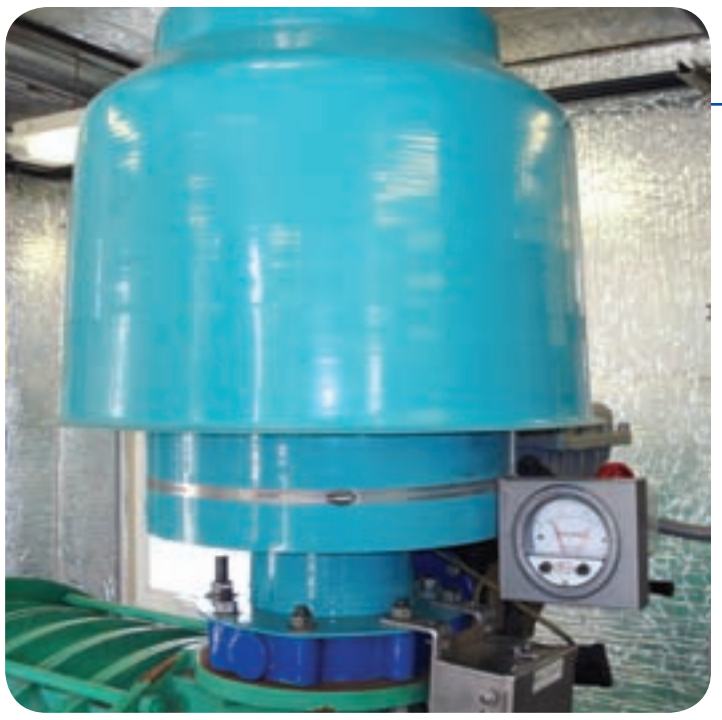


Boosting Blower **Performance**

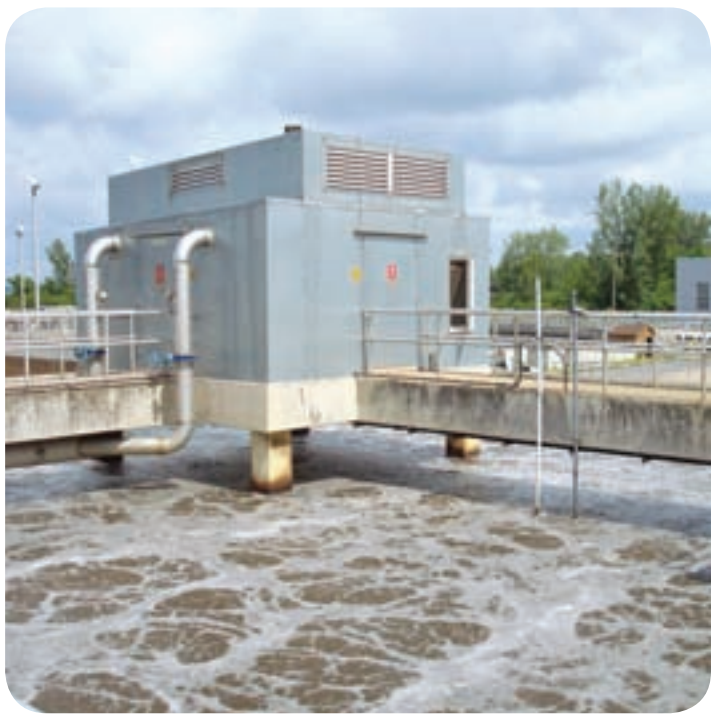
The Onondaga County Department of Water Environment Protection's Wastewater Treatment Plant (WWTP) features 32 multistage centrifugal blowers, which supply air to eight 1.4-million-gal aeration tanks. The tanks are at the heart of a facility serving the 270,000 residents of Syracuse, N.Y., and much of Onondaga County. Employing state-of-the-art engineering, the plant design features energy efficiency, equipment redundancy and flexible process capacities ranging from an average of 84 to 126 million gal per day (mgd), with a total hydraulic capacity of 240 mgd during wet-weather events.

By Jim Renk & Robert Geyer

The original filters were not provided as specified and alternate filters were accepted at the recommendation of the contractor. After all, a simple, passive device such as an intake filter is often not a key consideration in blower packages. The same assumptions about initial restriction, filter cleaning and cost recovery were valid for decades: "Choose a filter rated at 120% of blower capacity and everything will work out just fine."

The ultra-modern Onondaga County WWTP, however, originally included a new intake filter specification. In order to realize energy efficiency, the design called for a cartridge-style 8-in. outlet intake filter silencer that offered 99% nominal efficiency on 1-micron particles that would show just 2 in. W.G. initial restriction at 3,300 standard cu ft per minute.

Maintenance Superintendent Jim Renk, who has served Onondaga County for 30 years, was at the time a mechanical engineer for the plant. "Right away, we started having problems with the filters," Renk said. "The high pressure drop was tripping alarms and collapsing filters, so we reset our alarm limits to protect the blowers and went back and really studied the blower specifications and learned a lot."



Intake filter silencers bring energy, maintenance and labor savings to a New York WWTP

Top: Blower building interior with Endustra Tri-VentR P09 intake filter silencer and differential pressure gauge at the Metropolitan Syracuse WWTP.

Middle: Aeration basins and blower building exterior at the Metropolitan Syracuse WWTP.

Bottom: Aeration basins and blower buildings at the Metropolitan Syracuse WWTP. The plant has 16 buildings, each housing two multi-stage centrifugal blowers.

Ross Sanford received the assignment to study the problem and then spearhead the solution. Sanford is now retired, but at the time was crew leader and lead supervisor for the Predictive Maintenance Group at the plant. What Sanford discovered, after studying the original blower specification and then gathering physical data, was that initial restrictions across clean filter elements were in the 4- to 4.5-in. range—double the design specifications. Vibration analysis and laser alignment further suggested that the filters were causing undue strain on the blowers, and high amp draws confirmed that problem.

In order to keep the plant running, the only recourse was to clean filter elements and dispose of them up to eight times a year. Sixteen blower buildings housing 32 blowers added up to more than 250 replacements every year, plus weekly cleanings. Every time an element had to be cleaned or changed, the job required two people.

"The filter lids weighed in excess of 100 lb, and each element weighed nearly 60 lb," Renk said. "We were cleaning filters all the time, and that was a safety issue because of the excessive weight."

Temporary Fix

Sanford called upon Edco Sales, a Syracuse-area filtration specialist. Edco brought in Terry Yow, national sales manager for Endustra Filter Manufacturers. Endustra's inlet filter was used as the model for the performance specifications. Changing the filter housings was the immediate suggestion, but cost concerns initially ruled out a capital expenditure of more than $70,000 for filters that were still considered new.

As an interim solution, Endustra designed an element to be used with the existing housings that offered increased surface area that could withstand the differential pressures. For the better part of the next year, the plant continued to clean and change filter elements, but the elements were no longer collapsing.

Based on this incremental success, the county purchased a single 95%-at-5-micron Endustra P09 intake filter silencer approved by the blower manufacturer in late 2003. Onondaga staff made plans to conduct a cost-benefit analysis by recording gauge and amp-volt readings every month for one year. The Endustra housing was installed alongside an

existing filter, and the testing began.

Initial restriction across the Endustra filter silencer was 0.8 in. W.G., compared to 4.5 in. W.G., and initial amp draws were noted as being 4.5 amps lower. "We had learned that increased surface area would mean the filters would last longer, but it turns out that the design of the filter housing has a lot to do with blower performance as well," Renk said.

As the months went by, two maintenance technicians continued to change and clean filter elements on 31 of the 32 blowers. The Endustra P09 filter required no cleaning and no changes. Ten months into the test, the gauge read 3.2 in. W.G at 2,200 cu ft per minute—still lower than the initial restriction on the original filters. It was estimated that the filter element might last an additional six to eight months before a cleaning or change would be necessary.

Permanent Solution

Based on energy savings of $2,136 per filter per year, plus maintenance and labor savings, Sanford determined that the payback duration for retrofitting all 32 blowers would be approximately one year. The county fast-tracked the request into the bidding process. Endustra was the successful bidder with high-performance housings and elements, and the entire aeration system was refitted.

Four years after the installation of the Endustra Tri-Vent P09s, the county has saved hundreds of thousands of dollars in energy bills and no one cleans filters anymore. “The elements last so long that filter cleaning is no longer cost-effective,” Renk said. “We just wait until the delta-P gets too high. The life on these elements is excellent.”

When it is time to change filters, the job requires only one person and eliminates many safety concerns because the Endustra hood and element each weigh 20 lb. Further benefits realized by making the change include reduced vibration and reduced bearing wear. WWD

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