

# ONE THING LEADS TO ANOTHER



## Newark, Ohio's Licking River Wastewater Treatment Plant Achieves Unexpected Bonus From Aeration Systems Upgrade

### *Background*

Now in the second phase of its consent decree-mandated Long Term Control Plan to optimize interactivity between its four wastewater processing plants, Ohio's City of Newark is working to provide EPA-compliant, reliable service at reasonable rates. 2013 saw it completing Phase 1, with the installation of a new interceptor line that conveys sanitary sewer flow from the west end of town, through the downtown area's combined system, to the east end's Licking River wastewater treatment plant.

Design work continues on the separation of downtown sewers, in anticipation of renovation work to this area. Among other efforts, a significant element of 2014's plan is completing the

upgrade of the east end WWTP aeration system. Priorities for this project are replacement of 25-year-old existing equipment nearing the end of its service life, and significantly improving process efficiencies to reduce operating costs.

### *Challenge*

The plant sorely needed to increase efficiency in its aeration basins, WAS tanks, and a post-aeration tank, where aerobic bacteria break down waste in its activated sludge during a secondary treatment process. These bacteria thrive and best perform their function in sufficiently oxygen-rich environments. To create such conditions, blowers force air into the tanks through diffusers that create bubbles. The smaller the bubble, the more bubbles can occupy each unit

### **Project:**

Licking River Waste Water  
Treatment Plant

### **Date Completed:**

2013

### **Project Budget:**

\$1,875,875

### **Solution Integrated:**

EDI FlexAir MiniPanel Diffusers



*Installation of Mini-Panel Diffuser System*

of flow volume. More bubbles create greater surface area touching the surrounding flows, providing greater aeration efficiency. Electricity powering the large, aging motors on these blowers was Licking River's single greatest operating expense.

### *SOLUTION*

Newark sought relief from these excessive electric bills through significant process upgrades. The aeration system upgrade took a couple years to plan. Engineer Scott Phipps, formerly with consultants Arcadis Engineering in nearby Columbus, Ohio, spearheaded research into available new blower options. Arcadis conducted an initial two-month cost/benefit analysis that confirmed the project was worth pursuing. This was followed by an engineering study to determine primary considerations for new equipment. It identified the Standard Oxygen Transfer Efficiency (SOTE) factor specification as most important.

"We originally only intended to replace our two aging blowers with new, single-stage, high efficiency units," recalls Darin Wise, the plant's superintendent. "We hadn't really

thought it necessary to also replace the diffusers. But the technology has just advanced so much that efficiencies have really improved. Our research showed we could save more money in the long run by combining newer, highly efficient diffusers with the new blowers. So we decided to do the whole project."

Once diffusers were added to the upgrade, more research revealed that their panel sleeves, if manufactured of polyurethane could reduce fouling which adversely impacts SOTE. Other specified requirements included that service had to be fast and easy, and the diffusers had to offer a low overall ownership cost.

### *Getting to "yes"*

About a year after the initial study began, three potential vendors were identified and asked to submit bids. "All manufacturers met our specs," says assistant plant superintendent Bryan Curry. "At that point, our decision came down to value, and EDI (Environmental Dynamics International—wastewater.com) had the best offering." So EDI FlexAir® MiniPanel™ diffusers were specified for this application.

EDI Aeration Works crews performing installation of the new FlexAir® Mini Panel™ diffusers.



Installation of the first set of new diffusers was completed in late summer 2013, and the first new blower came on line in the early fall.

The city received a \$67,130 gridSMART grant from AEP Ohio (aepohio.com), from an application written by Arcadis engineering consultant Derek Dalton, to help fund this energy-saving project. Grant money was awarded after installation, based on pre- and post-install metering. The grant money covered only the cost of diffusers, since a stipulation of the grant was that covered expenditures must show a seven-year return on investment, which only the diffusers could demonstrate.

### *Result*

It was expected that the majority of electric savings would come from replacing the old 450 h.p. blowers with new, single-stage turbo blowers. That's because these new blowers at 300 h.p., require 33 percent less horsepower. Aeration blowers can draw up to six times their normal running amps upon startup, so the Newark crew installed soft starts, allowing the motors to draw less current over a slightly longer period of time. This means they won't kick a breaker on startup, and will start on plant generator power alone.

One additional benefit of the blowers running on plant generators alone is that they can perform full treatment of wastewater, even during extended power outages. "That's important," explains Wise, "because untreated flows spilling into the waterways during blackouts can be deadly. With the new setup, I think we're going to be good. As long as we can get fuel deliveries every couple of days, we won't be killing fish in the river during power outages." The new blowers can be adjusted for amperage draw via the inlet vanes and outlets, according to operating needs, avoiding breaker trips during very hot weather.

### *Unanticipated Benefits*

What wasn't anticipated was just how much more efficient the system would become when these new blowers were paired with the EDI FlexAir MiniPanel diffusers.

"These EDI diffusers are just so much more efficient," enthuses Wise. "Our air requirements have dropped significantly—sometimes to a third of what they were. Putting air in the water has associated costs, and now the bubble efficiency is better and our transfer efficiency is better. The MiniPanel diffuser creates more and smaller bubbles, which



**The plant crew had to make minor in-house modifications to fully equip this third basin for separate processing. They added an \$800 pump to return treated flows to the main plant stream, but these were one-time costs, far offset by earning potential. Staff also installed internal mixed liquor recycle (IMLR) pumps to replace the old air-lift ones that were inefficient and used a lot of air.**

**The new pumps have a propeller-type design that returns treated flows at the end of the aeration basin back to the headworks for de-nitrification and bacteria conditioning. This regains some air and removes nutrients. They're still tweaking the process for efficiency. "It's not the lowest-hanging fruit," explains Wise, "but it does factor into total efficiency boost and cost savings."**

also rise slower in the tank, to allow more contact time with bacteria."

This unexpected boost in efficiency actually allowed 100 percent treatment to be accomplished in just 2 of 3 dedicated basins. This freed up the third basin to treat trucked-in industrial waste and septage, generating new disposal fee revenues of \$83,000 from Jan. 1, 2014 to Feb. 24, 2014.

*"We were so happy with the savings and effectiveness, we're now installing a second, identical blower/diffuser combination," Curry says. "We'll depend on it as a redundant system."*

These improvements are projected to save \$168,000 per year in electrical usage and the plant already took in an extra \$153,000 in first quarter loading fees. Not a bad return for a little creative combination of new technologies.



## Long-Term Prognosis

Plant managers anticipate a similar ongoing rate of septage truck disposal, but perhaps not as high a premium as they've made all winter. This is because a local industrial facility lost its biological treatment capacity during the unusually cold winter of 2013-14, and Licking River took over that treatment. However, the industrial plant went back on line as the weather warmed, and Newark Wastewater lost those flows. They also can't continue to process landfill leachate due to the UV blocking it causes, further reducing trucked-in loads.

Still, the third basin now represents pure profit, and the plant makes some margin on high BOD/high ammonia flows that require their efficient new aeration basin. "If we can treat something in the digesters, we will," says Curry, "because we scrub our excess gas and sell it to the local utility."

Installation of the new, highly efficient bubble diffusers along with new blowers, has not only improved critical plant process, but save nearly \$14,000 per month in electricity fees. It has also created excess capacity that allows more plant loading, including trucked waste streams that have generated new and unexpected revenues.

Upgrade work has been going on for about a year, and is expected to wind up in June, with a total price tag of \$1,875,875. Wise is more than pleased with the amount of savings and profit the new blower/diffuser pairing is generating for his operation. "We initially had to spend extra on electric to allow for more air use to treat additional loading, but our electric bill still dropped significantly, between \$12,000-14,000 a month. □

More information about this topic can be obtained by contacting Tony Torres, EDI Global Marketing Director, at 573.474.9456 or email at [tony.torres@wastewater.com](mailto:tony.torres@wastewater.com).

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