

Targeting H₂S

TECHNOLOGY THAT FEEDS OXYGEN AND OZONE INTO FORCE MAINS AND LIFT STATIONS PROVIDES A FAST-PAYBACK ANTIDOTE TO ODOR AND CORROSION FOR A COLLECTIONS SYSTEM TEAM IN TENNESSEE

By Ted J. Pulsah

Brandon Ambrose and his maintenance team have enough to do maintaining 230 miles of gravity sewers, 19 miles of force main and 31 pump stations. The last thing they need is to spend time dealing with odor complaints.

And yet, over the years, the team in Mt. Juliet, Tennessee, fought a battle against hydrogen sulfide odor from wastewater in force mains. They controlled the odor with chemicals, but city leaders wanted a more cost-effective and sustainable way to deal with H₂S.

Ambrose, lead maintenance technician for the city's pump stations, found it in a technology installed at pump stations that generates pure oxygen and ozone, and injects it into the wastewater. First used in a successful pilot test at one pump station, the unit has been deployed permanently at four stations, and three more will be added in the next year. It has reduced H₂S levels at pumping discharge points from spikes of more than 400 ppm to less than 10 ppm. Payback on the equipment from chemical savings is estimated at 1.5 to three years.



Brandon Ambrose, lead maintenance technician in Mt. Juliet.

HIGH-VOLUME PUMPING

Mt. Juliet has no wastewater treatment plant, instead sending an average of 3.5 mgd to Metro Water Services in Nashville about 17 miles west. In-house team members handle the vast majority of collections system and pump station maintenance, including pump rebuilds, seal replacements, pipelaying and electrical work. They also service about 3,000 Myers 2 hp residential grinder pumps (Penair).

The city's population has roughly doubled in the past 10 years, to 28,000, mainly with residents who commute to jobs in Nashville. The

collections system is expanding rapidly to keep up with the growth. "We send a lot of water through force mains, some of them up to 15,000 feet long," says Ambrose, who holds a Collection Systems 2 operator's license. "Anytime you keep sewage in a line for a long time, that's a bad thing."

H₂S odor issues became so severe at some pump stations that a calcium nitrate solution was being dosed at 70 to 100 gpd. The chemical is effective and the team still uses it as needed, mainly at the city's smaller pump stations.

Through an industry contact, he learned about the FORSe 5 oxygen and ozone injection system from Anue Water Technologies. In 2010, the company deployed a trailer-based demonstration unit to test the technology at the



The FORSe 5 oxygen and ozone injection system is used to prevent hydrogen sulfide odors at lift stations in Mt. Juliet.

city's Nonaville Road lift station, discharge point for a 7,900-foot-long, 10-in force main with an average flow of 175,000 gpd.

After tapping the line to inject the oxygen and ozone, the city team, with help from Anue technical service representatives, made adjustments to optimize the feed rates. Once that was accomplished, average H₂S levels at the discharge point dropped from 80-120 ppm to 20-30 ppm within three days, based on ozone feed at 20 grams per hour and oxygen feed at 60 liters per minute.

MAKING IT PERMANENT

Satisfied with the outcome, Ambrose and Martin Keel, P.E., then public works director, secured funding from the city board of commissioners for permanent installation at the Royal Oaks lift station, which sends 250,000 gpd to the Nonaville Road site. The installation was completed in 2011 through remodeling of an existing building on the site.

The FORSe 5 system is designed for force mains up to 10 miles long with pressures to 200 psi and flows up to 30 mgd. Its main components include:

- A high-volume air compressor
- An oxygen concentrator that takes in ambient air and produces a dry air purified stream of oxygen with purity greater than 90 percent by weight
- An ozone generator that receives the purified oxygen and produces ozone at an average concentration of 5 percent by weight

A control system with a touch-screen interface enables users to adjust the flows of oxygen and ozone. "From my desktop computer, from a laptop or from an iPhone or iPad, I can go in and change the percentages of O₂ or ozone at any given moment," says Ambrose.



An Anue technician observes system component status remotely using the FORSe 5 digital telemetry technology.

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BRANDON AMBROSE

Before the FORSe 5 system installation, H₂S levels at the Royal Oaks station discharge routinely exceeded the maximum meter reading of 400 ppm. Afterward, the level dropped to a consistent 10 to 12 ppm. Two years later, the city installed a system at Nonaville Road in a prefabricated building. Feed rates at those sites are about 40 liters per minute O₂ and 10 grams per hour ozone.

In 2016, additional systems went online at the Cedar Creek station (2.9 mgd capacity), which sends the flow on its way to Nashville, and at the Central Pike station (4.5 mgd capacity). Ambrose expects to install three more FORSe 5 units to go online within the next year: "With the urban growth this community is having, there is no end in sight. We'll probably end up with 10 to 12 systems and maybe as many as 15 in the next 10 years." The target sites will be larger lift stations, especially those near residential areas.

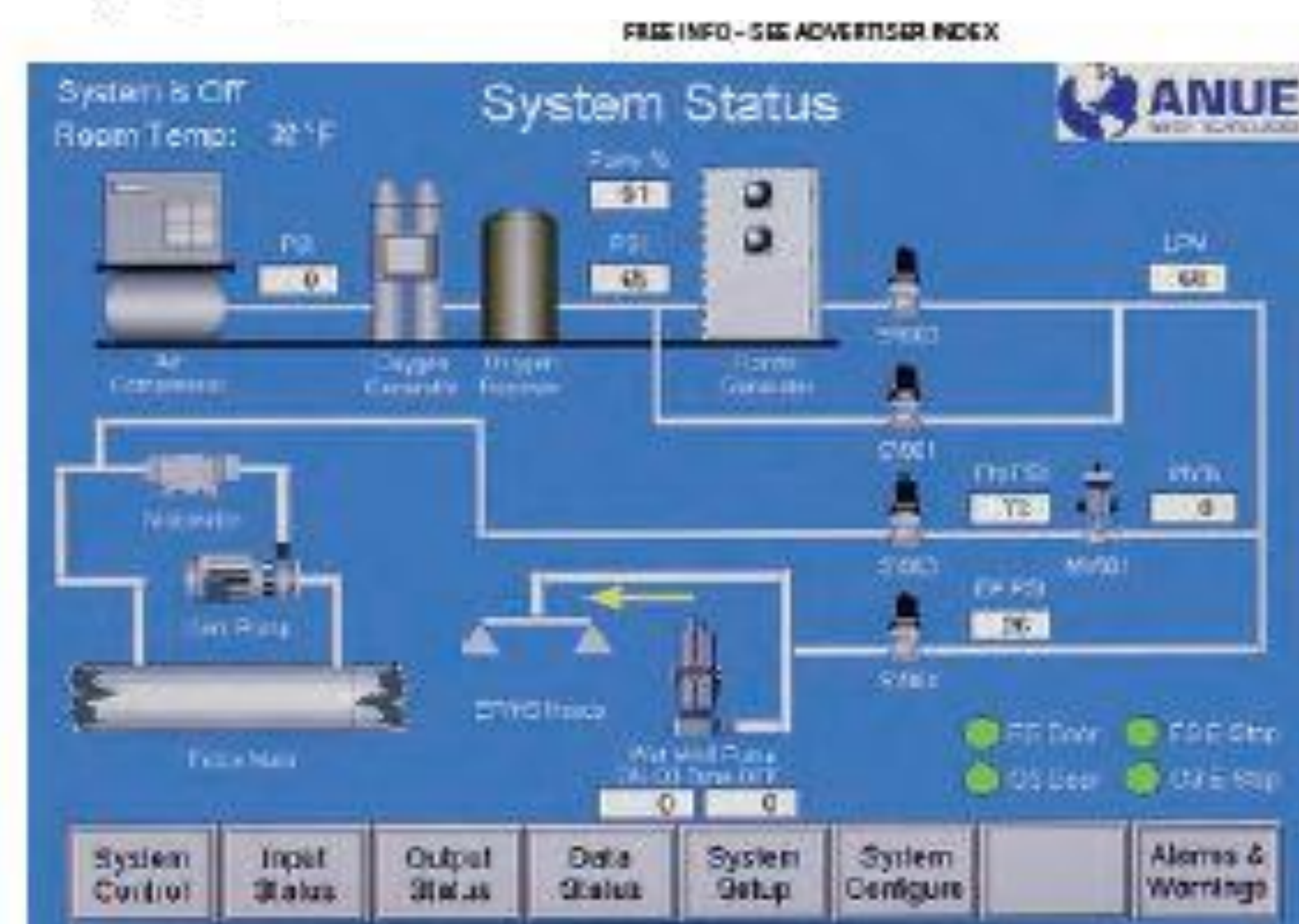
STANDARD PRACTICE

As the community expands, the city will either install an oxygen/ozone system at new large pumping stations or require the developers of large subdivisions to do the installations. The FORSe 5 systems' large capacity gives the city room to accommodate growth at each site.

During droughts and hot weather, when H₂S production in the lines can be extreme, the systems are supplemented with the addition of liquid calcium nitrate, especially in force mains. "We can't take the chemical out of the equation, but instead of feeding perhaps 100 gpd, we can get away with 20 gpd," says Ambrose. "The cost-effectiveness of these systems for us is mainly about reducing the chemical feed."

Besides reducing odor from H₂S, the Anue systems limit its corrosive effects. The ozone also helps break up fats, oils and grease (FOG) in wet wells. "We have wet well washers that come with the FORSe5," says Ambrose. "Once we start putting ozone into a wet well, we knock the FOG buildup down to near zero."

Ambrose expressed satisfaction with the equipment and with the service the city received from Anue Water Technologies: "I'm always eager to see big-



The digital telemetry measures water purity and pressure remotely so that an operator can view operating conditions from a desktop computer, laptop or mobile device and change the oxygen and ozone levels as needed.

ger, better and more user-friendly products. If you call Anue about issues with odor or corrosion, they will come out and check the site and demo one of their products if you want," says Ambrose. "That's what they've done for me."

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