PLANTPROFILE

NAME:

Neshaminy Water Treatment Plant

LOCATION:

Bucks County, Pa.

PLANT SIZE:

15 mgd

INFRASTRUCTURE:

Sedimentation basin, mixed-media filters, UV peroxide system

The UV lamps are kept at peak performance by the ActiClean system, shown here, which slides over the quartz sleeves containing the lamps.

Each of the 30-in.-diameter UV light units at the Neshaminy plant can remove up to 90% of algae in water.

A UV treatment unit awaits installation at the Neshaminy plant.

By Kate Cline

Smaller System, GREATER RESULTS

A Pennsylvania water treatment plant installs a new treatment system to improve efficiency and environmental impact

The Neshaminy Creek Water Treatment Plant in Bucks County, Pa., owned by utility company Aqua Pennsylvania, serves approximately 40,000 customers in Bucks and Montgomery counties. The conventional water treatment plant, which was built around 1900, has a 15-million-gal-per-day (mgd) capacity, but it usually produces 10 to 12 mgd during normal operation.

The plant's everyday treatment system includes a large sedimentation basin, eight gravity mixed media filters including sand and anthracite and a clearwell from which the treated water is pumped to customers. The facility uses a variety of chemicals for treatment, including aluminum sulfate for coagulation, lime for pH adjustment and chlorine for disinfection. Seasonal algae blooms require additional treatment. The Neshaminy plant previously used powdered activated carbon to treat the algae problems, but the facility recently upgraded to an ultraviolet (UV) peroxide system to improve water quality and efficiency.

Aging Infrastructure

The Neshaminy Creek watershed, which drains approximately 200 sq miles, experiences increased algae blooms in its streams and ponds each summer. The geosmin and methylisoborneol varieties do not pose a health hazard, but can give the water a musty, earthy taste and odor that some people are sensitive to even at low concentrations in the parts-per-trillion range. The plant used powdered activated carbon to treat the taste and odor issues, but found that this treatment method was becoming problematic.

Treatment with carbon required a 300-ft-diameter sedimentation basin with a long detention time—an average of eight hours. The basin took up a large amount of space, and the long detention time cut down on efficiency.

"I used to think the sedimentation basin was the best thing going, but when you start looking at things, it worked against us," said Plant Superintendent Tom Walton. "With that water sitting in an open basin with the 95° sun, we're killing out the algae that we're bringing in, but we're growing it on the other end of the basin."

Using carbon also meant creating a lot of waste. For every pound of carbon added for treatment, the plant needed to remove about a pound of waste that had to be processed and trucked to an onsite quarry. Because the quarry is a certified Pennsylvania Department of Environmental Protection (DEP) landfill, the carbon waste had to be laboratory tested to ensure that it met DEP standards. Demand had reached a point at which a much larger sedimentation basin would be needed to treat an adequate amount of water.

"It would have required additional pumping and would have really made the process much more difficult to manage, in addition to the fact that we would have doubled our solids production whenever we were feeding carbon," said Mark Lucca, vice president of production for Aqua Pennsylvania.

New Approach

Aqua Pennsylvania found a solution in a new UV peroxide treatment system. The entire system fits into a 20-ft-by-30-ft building, with two 7.5-million-gal reactors in the building's basement to provide treatment for the algae. The two 30-in.-diameter Trojan UV light units include the ActiClean system, which slides over the quartz sleeves containing the UV lamps to maintain optimum performance. The top floor of the new building houses the electrical switchgear to run the system. A tank was added about 50 ft from the building to hold the peroxide.

"We've been reading about UV light for disinfection for years. UV technology, in combination with advanced oxidation, is also not new," Lucca said. "It's been used for many years in mitigation of groundwater contamination, but it is relatively new in its use in the treatment of potable water for public water systems. We've taken a technology that's been around for quite some time, and we've been able to make it work for our needs at the Neshaminy plant."

The new treatment method was installed at the end of last summer, while algae levels were still high. It proved to be more efficient for operations because it requires a much shorter detention time (less than an hour) and creates no waste that needs to be removed. It is also more efficient at treating the musty taste and odor the algae creates. The UV system removes around 90% of the algae, a level that the plant could not achieve with carbon.

"At first I was skeptical," Walton said, "but this UV system has turned us around 100%."

Improved Footprint

One of the most important aspects of the new UV system is that it allows the Neshaminy plant to reduce its impact on the environment, giving it a smaller physical footprint as well as a smaller carbon footprint.

Aqua Pennsylvania calculated that the carbon footprint of using the carbon was 32,500 tons of carbon dioxide over a 20-year period, compared to 7,500 tons for the UV peroxide system.

"The first thing people say when you talk about a UV light system is that you just traded your carbon for your electrical energy," Lucca said. "When you consider what it takes to make the carbon, which is basically taking the wood or the coal and burning it, and the environmental impact of that, and then transporting it to the site, and then disposing of it, versus the use of electrical energy … it's still considerably less by using UV light than by the old method of doing it." WWD

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