

# world water

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## Sustaining clean water in war-torn Nigeria

# Pilot study leads to reduced capital costs at Hopewell

The City of Hopewell, Virginia, United States, plans to meet new nitrogen limits at its secondary wastewater treatment plant in 2018 following six months of pilot tests through a novel public-private partnership. Daniel Dair of *World Water Works* explains how the company's Ideal MBBR-DAF™ system reduced capital costs and improves effluent quality.

Through the combination of World Water Works' Ideal Moving Bed Biofilm Reactor (MBBR™) and Ideal Dissolved Air Flotation (DAF™) technologies, the Hopewell Regional Wastewater Treatment Facility (HRWTF) in the US state of Virginia will have the ability to meet new nitrogen limits to the James River within the Chesapeake Bay watershed. The company is providing its technology to the facility through a public-private partnership with the City of Hopewell, HDR Engineering, PC Construction, and Heyward Inc.

The MBBR technology in place at HRWTF allows for the nitrification of a segregated flow in order to meet the new ammonia permit requirements set forth by the government. HRWTF plans to meet this ammonia requirement in 2018. The MBBR technology is a fixed-film process rather than a suspended growth process, which provides protected surface area for bacteria to form biofilm and adhere to the surface of the free-floating media. Biofilm systems are governed by diffusion limitation, as substrates need to penetrate the biofilm structure, which can often be a limitation. However, in the cases of inhibitory compounds, it lends a significant advantage over suspended growth systems that are not as strongly influenced by diffusion.

HRWTF, a secondary wastewater treatment plant, currently treats an annual average flow of approximately 102.2 million liters per day (MLD) of wastewater from local industries and domestic sources while serving more than 9,300 customers. The plant began operating in 1977

and was designed to treat for biochemical oxygen demand (BOD), remove total suspended solids (TSS), and employ the use of pure oxygen. The facility has achieved treatment goals for BOD and TSS; however, treatment regulations have changed over the years and now require the removal of nutrients. HRWTF was previously below the waste load allocations for phosphorus within the facility, and has recently been able to meet the nitrogen allocations through the purchase of nitrogen credits under the Nutrient Credit Exchange Program.

The source of more than 80 percent of the facility's wastewater comes from industry, some of which contains known toxins to ammonia oxidizing bacteria (AOB) and nitrite oxidizing bacteria (NOB). AOBs and NOBs are responsible for the traditional nitrification of wastewater. To manage and mitigate the limiting effects of these toxins, in late 2012 through early 2013, HRWTF conducted an extensive evaluation and pilot treatability study of various technologies to select the appropriate technology to treat the water. With more than 6 months of pilot testing complete, World Water Works' Ideal MBBR-DAF system proved to be the leader. The system consistently brought facility treatment levels to the future target requirements while proving to be robust against the hard-to-degrade and potentially toxic industrial wastewater sources being treated. The success of the pilot treatability study also led to a reduced capital expenditure and provided an easily implemented unit process for the plant.

To support the City of Hopewell with a cost effective and timely solution, team members from HDR Engineering, PC Construction, Heyward Inc., and World Water Works worked together to present the option of a public-private partnership. After further evaluation of the initial proposal, it was found that the partnership had the ability to implement the project more quickly as a team and at a substantially lower cost than the traditional design-bid-build path.

As a result, the HRWTF has the opportunity to gain a state-of-the-art system with a binding performance guarantee from World Water Works. The price from the company is also guaranteed in addition to being lower than originally anticipated. The system allows for local waterways, as well as the Chesapeake Bay, to be supplied with better water quality more quickly.

This form of a public-private partnership allows for the overall working process to be much more efficient. The partnership eliminates overlap and the repetition of tasks by assigning each partner a specified area and therefore streamlining the process. The design allows for a collaborative process that saves money for the client, allows for the risk to be divided by six different entities, and offers a competitive advantage when submitting the overall proposal to the local government. While not all municipalities have the legislation in place, more states are viewing this type of process with renewed interest. Wastewater treatment is new to public-private partnerships; however, the process has been widely used in the past for a number of large-scale public works projects.

This project is well underway, and the HRWTF is anticipating flowing wastewater in the summer of 2017. The new facility has been designed to handle the future flows and loads anticipated for 2040.

## Author's Note



*Daniel Dair is the vice president of innovation at World Water Works, Inc., a manufacturer of specialized process and wastewater treatment technologies based in Oklahoma City, Oklahoma, USA. With more than 13 years of experience in the MBBR and Integrated Fixed-Film Activated Sludge (IFAS) field, Dan has worked with both industrial and municipal clients on biological oxygen demand and nutrient removal systems.*



The Ideal Dissolved Air Flotation system installed at the Hopewell Regional Wastewater Treatment Facility. Photo credit: World Water Works