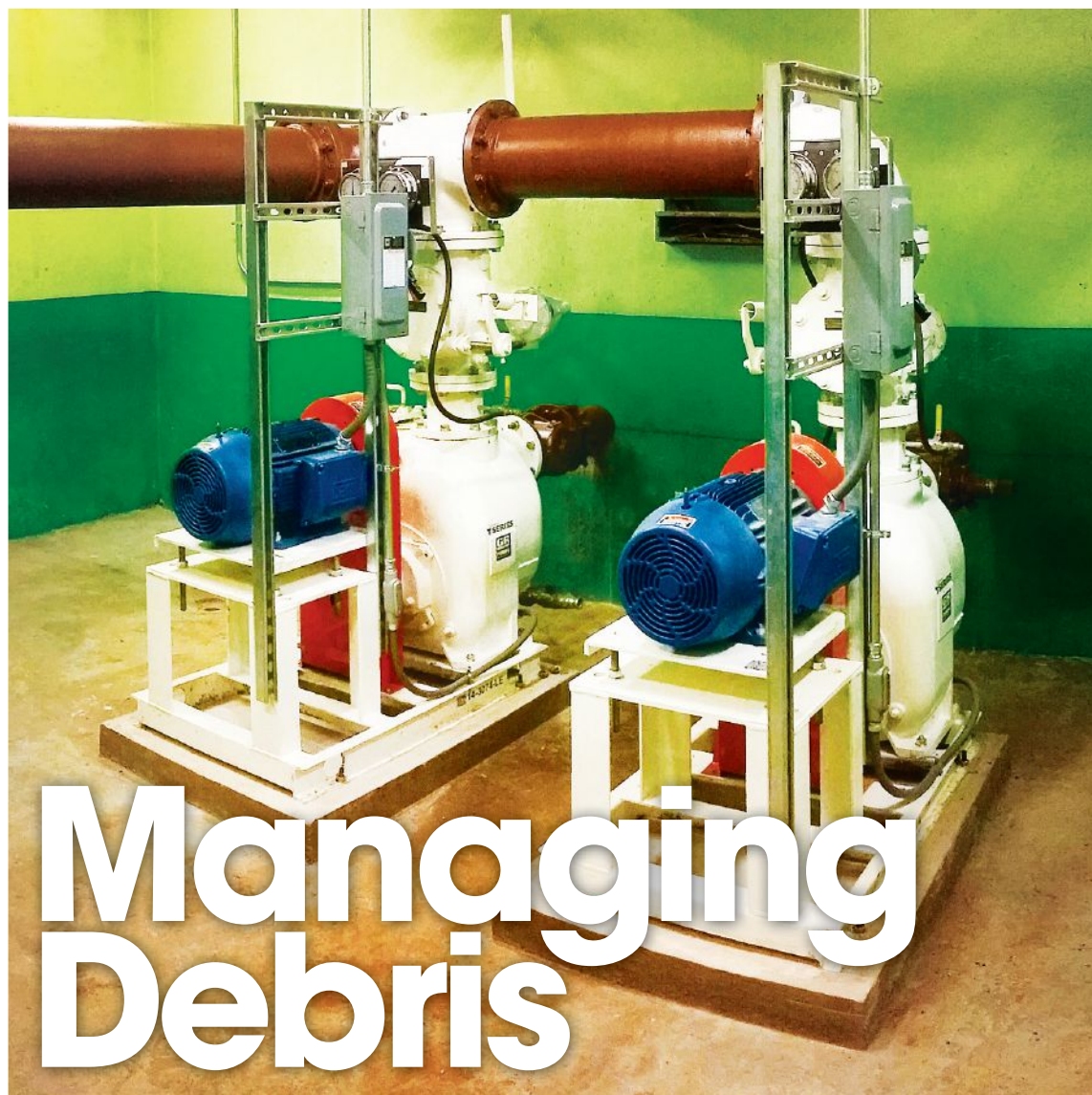




# Managing Debris

By Jim McMahon

Pennsylvania wastewater treatment plant manages non-dispersible debris at influent pump station

**F**or decades, wastewater treatment plant (WWTP) operators have dealt with clogging problems at their plants and pump stations, but the rise in the use of disposable wipes and other non-dispersible products has accelerated the problem to epidemic proportions in just about every municipality worldwide that relies upon a functioning wastewater treatment system.

Wet-wipe use overall has nearly tripled in the past decade, according to Smithers Pira, a marketing and consulting firm focused on the packaging, paper and print industries. When these paper towels, cleaning cloths, baby wipes, diaper liners, feminine hygiene and cosmetic wipes are flushed down the toilet, they reach the influent pump station at wastewater treatment plants relatively intact, clogging and jamming pumps, check valves, and screens, and increasing maintenance, repair and operational costs.

Influent pump stations are the first processes impacted by non-dispersible debris. If the pump station has a coarse-bar screen positioned before the pumps, some of the non-dispersible material will be captured before reaching the pumps. But these original-equipment screens, with their 1- to 2-in. openings that may have performed satisfactorily for decades, often cannot keep up with the increased flow of non-dispersibles, allowing this material to reach the pumps. This negatively impacts their operation, requiring more frequent shutdowns to perform clean-outs, maintenance and repairs.

Pump station upgrades primarily have focused on pump replacement with limited regard given to non-dispersible products. When original-equipment coarse-bar screens are present they usually are left in place, and screen upgrades are located downstream of the new pumps due to the limited narrow configuration of the existing wet well. Screening is recommended to protect pumps and other equipment from

debris-laden influent sewage entering the WWTP. Consequently, even when pump upgrades are initiated in pumping stations, the performance of the new pumps is compromised from the overwhelming influx of non-dispersibles.

## Zerbe Township WWTP

This circumstance is what the Zerbe Township WWTP encountered in 2016 after upgrading its primary influent pump station the year prior.

Zerbe Township, located in Northumberland County, Pa., and encompassing the town of Trevorton with approximately 1,900 residents, recently upgraded its WWTP to bring it into compliance with Pennsylvania Sewage Facilities Act 537 and the Chesapeake Bay total maximum daily load (TMDL). Act 537 requires municipalities to develop and implement comprehensive plans that resolve existing sewage disposal problems and provide for the future sewage disposal needs of municipalities under the oversight of the Pennsylvania Department of Environmental Protection. The TMDL was established in 2010 by the U.S. Environmental Protection Agency (EPA) to restore clean water in Chesapeake Bay and the region's streams, creeks and rivers. The TMDL set pollution limits equivalent to 2004 EPA standards on nitrogen, phosphorus and sediment, with specific deadlines for implementation.

Originally built in 1963, the Zerbe Township WWTP consisted of two primary clarifiers and a drying bed, which decanted into Zerbe Run, flowing into Mahanoy Creek, the Susquehanna River and ultimately Chesapeake Bay. Prior to the implementation of the TMDL, the Zerbe WWTP's nitrogen, phosphorus and sediment discharge loads were considered non-significant. But under the TMDL mandate, Zerbe's treated effluent concentrations for nitrogen, phosphorus and sediment discharges were reduced in conjunction with an increase in hydraulic capacity to 0.5 million gal per day that was required under Act 537. These changes necessitated a significant plant upgrade to an activated sludge sequencing batch reactor process, and required increased influent pump capacity within the existing pump station. These plant upgrades were initiated in 2014 and completed in 2016.

## Upgraded Influent Pump Station

The duplex pump station was upgraded with heavy-duty solids-handling pumps manufactured by Gorman-Rupp Pumps. The self-priming, centrifugal 6-in. Super T Series pumps are located in a non-hazardous area above and separated from the wet well. The self-priming suction lift design of the pumps allows the design engineer to physically locate the pumps where access is a non-issue and routine maintenance can be completed quickly and easily.

"Each pump provides a maximum capacity of 1,050 gal per minute, equal to three times the average influent design flow rate," said Steve Solon, sales engineer for Envirep Inc., which specified and installed the new pumps.



The large volute design allows automatic re-priming in a completely open system without the need for suction check valves, even with the pump casing only partially filled with liquid and a completely dry suction line. The pumps' two-vane, semi-open solids-handling impellers handle up to 3-in.-diameter solids. Pump-out vanes on the impeller shroud reduce foreign material buildup behind the impeller and reduce pressure on seals and bearings. Additionally, double-floating, self-aligning, oil-lubricated mechanical cartridge seals, with stationary and rotating faces of silicon carbide, are specifically designed for Zerbe's abrasive wastewater.

"Directly downstream of the influent pumps, an EnviroCare screen was put into place, which removed unwanted solids prior to the wastewater treatment process," Solon said. "Ideally, a screen would be installed before the pumps, but at Zerbe that could not be done. The existing influent wet well was fairly deep, and there was inadequate space to install a screen."

Because the influent pumps are located before the screen, the pumps had to deal with a significant quantity of disposable wipes and other non-dispersible material from the collection system. Although the frequency was considerably less than with the original pumps, the plant was still experiencing jams and clogs.

"With the Super T Series pumps, the incidence of clogging is reduced compared to most other heavy-duty solids-handling pumps," Solon said. "The unique impeller design and the ability to adjust clearances between the impeller and the wear plate help to reduce clogging. If a clog does occur, the maintenance time is much less—the front cover plate can easily be opened to remove the jammed debris."

Even though the new pumps allow easier and faster clean-outs, it would still take an hour to open up the pumps, clean out the debris and close them up.

"We still needed to clean out the pumps and the check valves at least once or twice per week," said Ed Reed, chief operator for the Zerbe WWTP. "HandiWipes, baby wipes and that sort of stuff, they do not grind up in centrifugal pumps—they just pack in and wedge the pumps' impeller."

## Solids Management

To minimize clogging,

Envireprecommended that Zerbe install an Eradicator solids management system on each pump. The system is an add-on to existing Super T Series pumps and provides an aggressive self-cleaning wear-plate incorporating a number of notches and grooves. It also features a lacerating tooth that helps break up stringy material, scrape it off the impeller vanes and pass it through the pump. Installation is done without impacting performance or interrupting service.

"Eradicator-equipped pumps do not require expensive chopper blades that need periodic replacement, but rely on passing large solids and stringy materials straight through the pump," Solon said.

The system includes a lightweight inspection back cover that can easily be removed if it is necessary to inspect the impeller. This makes it easy and safe to perform routine inspections.

"The Eradicator has definitely reduced our clogging," Reed said. "Since we put in the upgrade kits six months ago, we have not yet had to open up the pumps to clean them out to remedy a jam or clog. We have done nothing more than routine maintenance on the pumps." **w&wd**

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