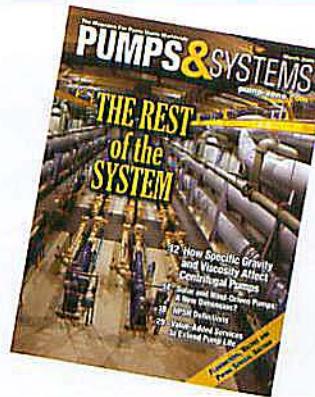


Combined System Overflows

Daniel Lakovic, seepex, Inc.

Reprinted from June 2009
PUMPS&SYSTEMS



Progressive cavity pumps and clarifiers ensure clean water for Toledo, Ohio.

Combined system overflows (CSO) put a significant toll on the Great Lakes, especially considering all the cities that discharge into them: Milwaukee, Chicago, Toledo, Detroit, Cleveland, Buffalo, Toronto and Montréal. These same cities—totaling tens of millions of people—use the lakes as a source for drinking water. The Great Lakes contain 22 percent of the world's fresh water and are an integral part of the agricultural economy in an area with a fishing industry worth more \$4 billion/year.

Massive rainwater surges have plagued Toledo, Ohio's Bay View Wastewater Treatment Plant (WWTP) for years. Large rainstorms would overload the plant's treatment capacity and bypass the facility into the local Maumee River, which eventually flows into Lake Erie. The city needed a facility that could handle rainwater surges exceeding 200 mgd.

In response, water treatment equipment provider Infilco Degremont built one of the first CSO abatement plants in the Great Lakes area. The new wastewater treatment facility can handle excess rainwater (an additional 200 mgd) during extreme conditions. The new facility incorporated an innovative system using high-rate solids contact clarifiers and progressive cavity (PC) pumps. The installed facility is the largest high-rate CSO treatment plant in North America.

Facility Details

The system has several distinct zones. Screened wastewater flows by gravity into a rapid mix zone where coagulants are added. This mix flows into a reactor where PC pumps drive polymer feed systems that supply the reactor and/or recycled sludge lines with polymer to assist in the flocculation process. The piston flocculation zone provides a gentle mixing condition that enhances flocculation and densification. Flocculation coagulates the solids within the sludge, which will eventually be

Major cities throughout America are operating outdated WWT systems. The technology for improvement exists and implementation is necessary to ensure quality of life for generations.

Consumers can make a difference by supporting initiatives to protect and improve the nation's aging clean water infrastructure.

formed into a combustible fuel.

Oil, grease or other floatable materials are removed through scum removal systems that skim the top layers. The clarification/thickening zone continues to separate fluids from solids, which settle into a sludge at the bottom of the tank. Excess sludge is pumped for further processing and the clarified effluent is disinfected and discharged into the Maumee River.

The facility uniquely provides the ability to treat both primary and CSO wastewater. To incorporate this operation flexibility, an operational guideline was created for the Bay View WWTP. Based on the incoming flow and status of the equalization basin volume, multiple operation modes are available. The excess flows can be

directed to the high rate clarifiers (HRC) and effluent from the clarifiers can then be sent to the activated sludge system.

During high flow events, HRC effluent can be directed to the equalization basin. When the basin reaches design capacity (25 million gallons), the flow is then directed to the dedicated wet weather disinfection system and blended with the plant effluent from the dry weather facilities before being discharged into the Maumee River.

The sludge clarification and thickening technology not only saves the city money but has also greatly improved the environmental impact. Through the sludge thickening process, which recycles the waste particles into optimum solids, the facility has reduced fossil fuel consumption.

Progressive Cavity Pumps in the System

Progressive cavity pumps are critical to the efficient, compact operation of the clarifiers. Sludge circulation within the system will cause damage to the long molecular chains of the flocculant, which will decrease efficiency. This, in turn, would require a larger system that would fill significantly more area.



Polymer feed pumps at the CSO abatement plant.

As a result, PC pumps are preferred over pump types like lobe, peristaltic or plunger designs, which generate more shear.

The geometry of the chosen PC pump has the lowest shear

rate of any PC pump geometry. The long pitch-length of the stator results in less circumferential movement inside the pump, which lowers internal velocities and slip, the main elements of shear in a pump.

Fifty-five sludge handling PC pumps are at the facility. The new site expanded the plant's capacity by 232 mgd in a 43,500 ft² area (equal to a little more than an acre or less than half of a hectare).

Plant for the Future

This WWT facility ensures clean water and a healthy environment for Toledo citizens for many generations. "Since the start-up of the Wet Weather Treatment Facility in October 2006, we have had zero plant bypasses," said Keith Helton at Toledo's Division of Water Reclamation.

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Electricity moves at the speed of light. Panel shops, contractors and electricians are a bit slower. The new seepex integrated pump and drive installs easier than a home stereo.

The pumps integrate a gear reducer, TEFC motor and a NEMA 4 "vector-type" VFD with a standard 120 VAC 5-15p plug. Control interface (4-20 ma), run dry and over pressure protection are attached with standard 1/2" UNF-connectors. Assembled from stocked components, rated to 4.5 gpm and 360 psi.

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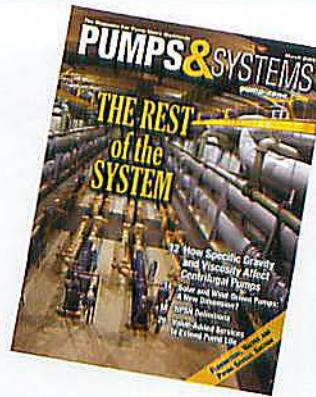
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