

PRODUCTS IN ACTION

Many treatment plants require additional filtration capacity but lack the site space to install additional basins. The Fox Metro Water Reclamation District (WRD) plant serving Aurora, Ill., used shallow-bed traveling bridge filters to solve this problem.



By Hui Lin, P.E.

FIT A HIT

The sand filter basins at an Illinois treatment plant gained capacity from a cloth media filter retrofit

ARTICLE SUMMARY

Challenge: The Fox Metro WRD needed more filtration capacity but did not have the site space to add basins.

Solution: Shallow-bed traveling bridge filters were retrofitted into the facility.

Conclusion: The cloth media filter technology raised hydraulic capacity and lowered TSS levels without exceeding spatial requirements.

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When the Fox Metro WRD started up in the 1920s, its trickling filter system was designed to treat an average daily flow of 8 mgd.

Today, the district serves a population of almost 250,000. Plant processes include a bar screen, grit removal, primary clarifiers, aeration tanks, secondary clarifiers, traveling bridge sand filters and chlorine disinfection. The plant is designed for an average daily flow of 42 mgd and a peak flow of 85 mgd, and it discharges treated effluent into the Fox River.

High flows and high solids concentrations were more than the nine existing 16 x 12-ft traveling bridge sand filters could handle, so Fox Metro began researching other tertiary filtration technologies for a more effective alternative. The WRD considered retrofitting the sand filter tanks with cloth media AquaDisk filters from Aqua Aerobic Systems but discovered that they would better suit the plant's hydraulic profile requirements.

Filter evolution

For many years, granular media filters that operate by gravity flow provided an adequate means of removing solids from wastewater streams. The cloth media AquaDisk filter utilizes a unique cloth medium, rather than conventional granular media, mounted in a vertical circular disk configuration. This setup allows for a large filtration area in a small footprint—roughly one-fourth of that required for equivalent gravity granular media filters.

The cloth media AquaDiamond filter utilizes the OptiFiber pile cloth filter media. It is applied in a lower profile diamond configuration that easily retrofits into existing traveling bridge filter cells while maintaining the original gravity feed. Other benefits include a smaller footprint and higher hydraulic and solid-loading rates.

Operation

Cloth media technology traps solids on the cloth surface and within the cloth depth, allowing only filtered water to pass through. During filtration, the cloth media is completely submerged. Solids are deposited on the outside of the cloth as the influent wastewater flows through. The filtered effluent is collected inside the diamond lateral and discharges by gravity. The filtration process requires no moving parts.

As solids accumulate, headloss increases, thus initiating a backwash. During the backwash, a pump provides suction to the vacuum heads, allowing solids to be vacuumed from the cloth as the platform traverses the length of the diamond laterals. The platform operates only during backwashing and solids collection.

Because of the vertical orientation of the media, some solids will settle to the basin floor during normal operation. Small suction headers provide a means for collecting and discharging the settled solids. The solids collection process utilizes the backwash pump for suction. The cloth material is engineered to control the buildup of biological growth common in sand filters, improving long-term reliability and reducing maintenance.

Installation and testing

The AquaDiamond cloth media filter installed at the Fox Metro WRD plant raised the basin peak capacity from 10 to 24 mgd with modifications to the interior walls. With the success of the trial in 2005, two additional basins were converted in 2006, providing a total peak capacity of 72 mgd.

Two additional filter basins are being converted in 2007, raising the total maximum design hydraulic capacity in the five cloth filters to 120 mgd, approximately 30% more than the maximum design rate of the original nine traveling bridge sand filters. Additional benefits of the cloth media filters are higher solids-loading capabilities and less maintenance.

A three-week filter performance test was conducted at Fox Metro WRD plant in April 2006. Hourly influent and effluent grab samples were collected each day and sent to a local certified lab for total suspended solids (TSS) analysis. The results demonstrated that the filter met the effluent TSS objective of less than or equal to 5 mg/L under normal and "upset" operating conditions.

During the test period, the filter experienced a maximum influent TSS of 171 mg/L at a flow rate of 18.36 mgd. It quickly recovered after influent went back to normal conditions. The average daily backwash rate was less than 1.5% of the forward flow during the test.



Results

The AquaDiamond cloth media filters solved the problems associated with limited hydraulic capacity, periodic solids overloading and excessive maintenance required by the existing traveling bridge sand filters at the Fox Metro WRD plant. This was accomplished without additional land use and with minimal civil modifications to the existing filter basins. **WWD**

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