

Folded Flow DAF System Helps Mohawk Paper Raise Capacity

Faced with aging technology and infrastructure, Mohawk Paper needed more capacity at its Waterford, New York, mill. The company chose new technology to solve limitations in wastewater treatment.

Mohawk Paper Mills Inc. is one of the few privately held mills in the USA. It is owned by Tom O'Connor Sr. and other family members. The company is considered a leader in the manufacture of premium printing papers. Mohawk's Waterford mill complex is one of the two largest premium text and cover paper operations in the industry. The company has grown from 900 tons per year on three paper machines in 1878 to 100,000 tons per year today.

The mill's story, however, began with the Mohawk and Hudson Paper Company, which was established in Waterford soon after the American Civil War in a building constructed in the 1800s. Initially, the operation employed 40 people who produced three tons of printing paper a day, using rags, wood and straw as raw materials. In 1917, a second paper mill was constructed in Cohoes, New York.

Mohawk president and COO Tom O'Connor refers to Mohawk as "a technology company." The company's strategy is focused on investing in technologies that positively affect quality and customer responsiveness. He credits Mohawk employees with collectively creating a culture known for its quality, adaptability and innovation.

Committed to environmental responsiveness, the company invests millions of dollars each year to reduce the effects of its operations on the environment. In addition, employees throughout the company are committed to utilizing natural resources effectively.

Using Evolving Technologies to Overcome Challenges

The environmental protection personnel at the Waterford plant faced aging wastewater treatment technology, more stringent discharge requirements and changing production needs. Using creative engineering and some of the existing infrastructure, the team at Mohawk, with help from USFilter, was able to address these needs, while increasing the plant's effluent water quality.

Mohawk Papers has used a dissolved air flotation (DAF) system since the early 1970s to treat process wastewater. While the existing system was state-of-the-art when installed, DAF technology has evolved and adapted to the requirements of the industry over the succeeding years. Several years ago, the plant's fiber removal capacities were operating at approximately 80% efficiency. Large amounts of fiber would settle and stick to lamella

plates within the system. When the fiber buildup became significant, operations were curtailed, resulting in lost production revenues and manual labor cleaning costs. Generally, weekends were utilized to remove the fiber, so production could resume on Monday.

Plant personnel also faced changing environmental regulations, which would require plant discharge with lower suspended solids content. The mill also confronted additional capacity needs to meet current and future production requirements. Compounding the problem, the mill is landlocked by the King's Canal, a community built since the mill was established in the late 1880s.

An Advanced DAF System

Mohawk plant personnel met with USFilter engineers to find a solution. The team decided to retrofit the mill's existing DAF technology with a Folded Flow® DAF separator, allowing increased capacity and efficiency, while still using the existing system footprint. The new system offered unique features to meet Mohawk's needs. USFilter custom-designed and installed a single, three-shaft bottom sludge collector and a two-shaft surface skimmer, all retro-fitted to the existing ceramic tile tank. A stainless steel baffling and distribution system was added to the existing tank to create the new hydraulic flow pattern.

In order to test the new design configuration, a demo system was tested during a large-scale pilot program over several months by the Mohawk wastewater treatment plant personnel. Wastewater was treated successfully with the test equipment during construction of the upgrade and met Mohawk's specifications for a

A COMPARISON: OLD AND NEW

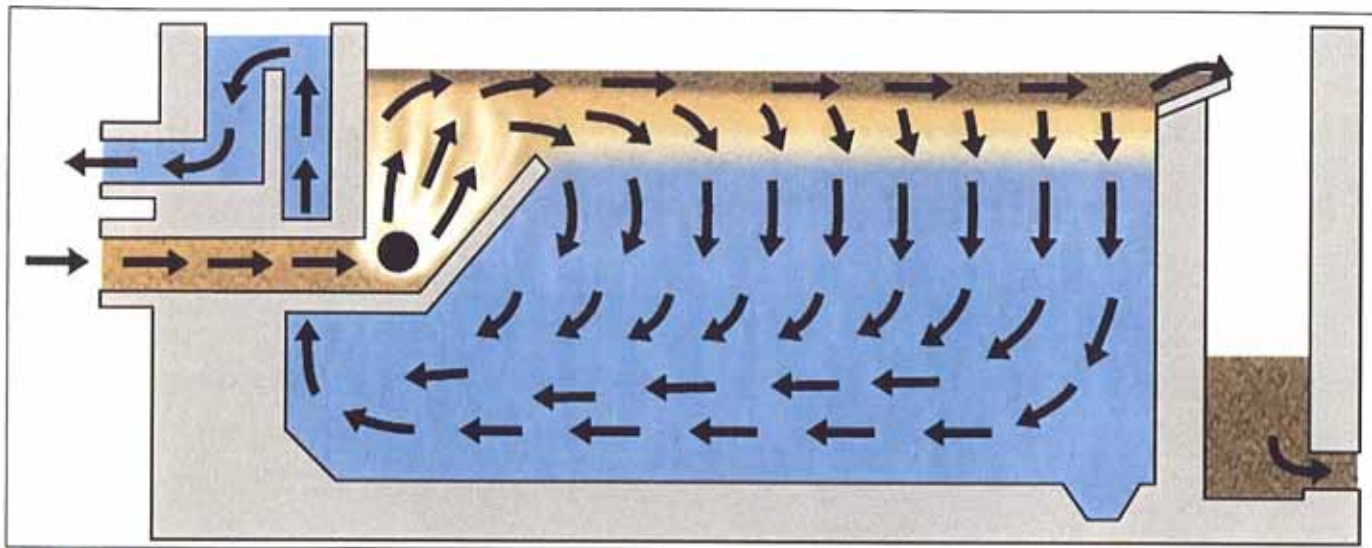
Design Basis: Size was 18' x 15' x 5' side water depth

Old system:	Average	Peak
Influent TSS	450 mg/l	1,200 mg/l
Influent flow	800 gpm	1,600 gpm
Recycle flow	160 gpm	160 gpm
Total flow	960 gpm	1,760 gpm
Surface overflow rate	3.5 gpm/ft ²	6.7 gpm/ft ²

Design Basis, New System: 18' x 20' x 7' side water depth

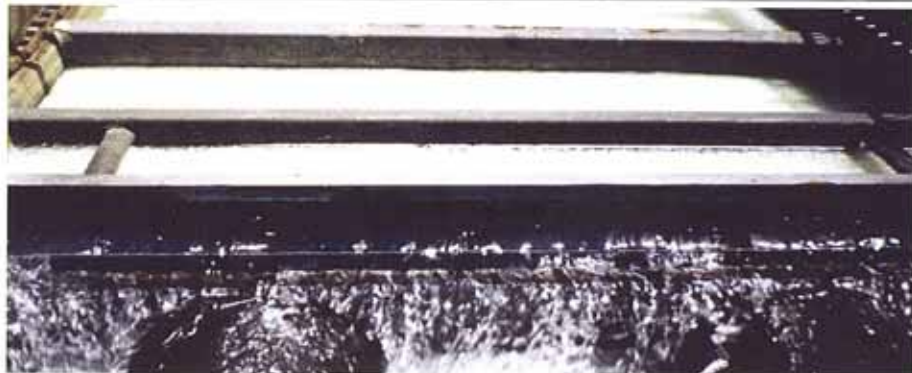
New System	Design	Actual
Influent flow	2,200 gpm	3,000 gpm
Recycle flow	350 gpm	750 gpm
Total flow	2,550 gpm	3,750 gpm
Surface overflow rate	7.1 gpm/ft ²	10.4 gpm/ft ²

Bob Wentz, Mohawk Paper Mills, and
George Milner, USFilter



Above: USFilter's Folded Flow® DAF separator. Left: Effluent is discharged from the same end of the tank where it is introduced.

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continuously moving across the floor of the DAF tank, eliminating build-up. These collectors move about one-quarter mile per hour, continuously pushing the settled solids to a trough for automated removal.

new effluent value of less than 100 mg/l of TSS.

As part of the new configuration, treatment plant effluent first flows through rotary disc screens to remove the larger particles. Then it is pumped to the DAF inlet, where chemical/mechanical conditioning has been added as part of the upgrade. The DAF effluent goes to a Parshall flume for flow measurement and then directly into the river channel through a diffuser. DAF float and settled solids are collected and pumped to a rotary screw sludge press and sent for disposal. Sludge screw press filtrate is sent back to the treatment plant effluent sump to be fed back to the DAF separator.

Close-up of the Technology

The Folded Flow® DAF separator has proven economical in both recycling and end-of-pipe treatment applications, providing 95 percent recovery of solids and processing twice the flow of existing DAF save-alls. This DAF separator can be used with new or existing systems and can be installed in steel or concrete tanks.

The separator is somewhat similar to conventional DAF separators. With both designs, as influent enters the tank, it mixes with countless micron-sized air bubbles, creating a "density current" that rises and spreads quickly along the DAF surface. The

similarities end, however, in comparing how the density current moves through the two types of separators. The design takes advantage of the density gradients and currents inherent in every flotation process to optimize tank hydraulics. The result is greater efficiency at higher flow rates.

As the hydraulic current travels laterally, the heavier clean water peels away from the bottom of the air/solids/water mixture and flows downward. The separator then "folds" the flow by removing effluent from the same end of the tank where the influent is introduced. This hydraulic design more than doubles the tank's plug flow character, allowing efficient clarification with great variations in wastewater flow and solids loading. Hydraulic loading can be doubled or tripled, while maintaining or improving effluent quality.

With its small footprint, the separator maintains the superior float solids concentrations and energy efficiency of its conventional counterpart. Especially suited for pulp and paper applications due to its high hydraulic loading capacity and effluent quality in fiber recovery applications, it utilizes a high efficiency, low operating cost air dissolution system with advanced performance capabilities.

The design also can incorporate bottom collectors to keep non-floatable solids

New Life for an Old System

Through the system upgrade, the team was able to breathe new life into an older technology. The new system has increased treatment efficiency, reduced maintenance and production downtime and improved the water quality leaving the plant.

According to George Milner, Vice President-Environmental Affairs for Mohawk Paper Mills, "The design that was retrofitted into our existing DAF tile tank has proven to be a very effective system for removing suspended solids. The unit is very tolerant of extreme changes in flow and solids loading. We also gained a three-fold increase in clarifier throughput without giving up additional floor space. Most importantly, however, the quality of our discharge water was greatly improved."

Along with improving the water quality leaving the plant, Mohawk makes good use of its pulpy, fibrous waste product from the separator. The recovered waste pulp — about a million pounds every year — is recycled as organic composting, industrial bedding, carton boxes, and burned for energy. ▲

Bob Wenta is manager of sales and marketing for HPI/CPI industries at USFilter's Envirex Products. George Milner is a senior vice president for Mohawk Paper Mills in its Waterford, New York mill.