xylem

Folded Flow® dissolved air flotation separator



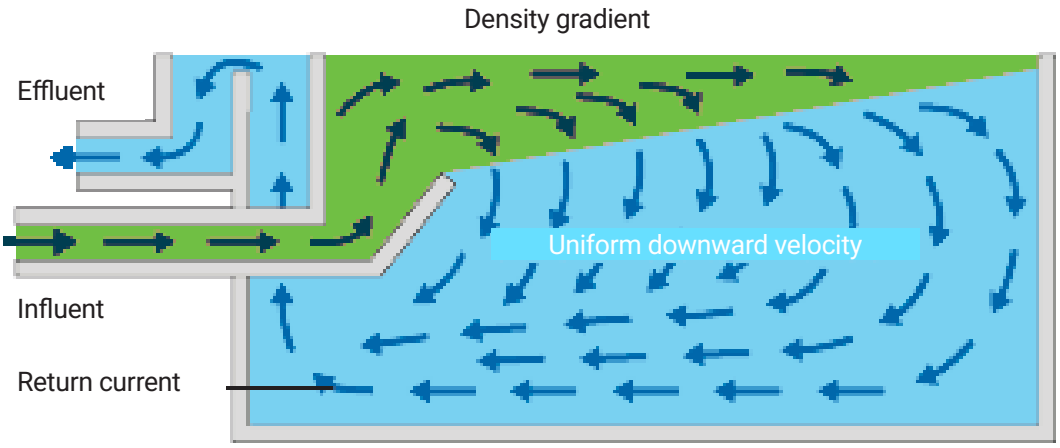


Figure 1. The Folded Flow DAF separator works with density currents to make full use of the tank's volume. This improves hydraulic detention time and effectively eliminates short circuiting.

Folded Flow DAF the next generation

How the process works

The Folded Flow Dissolved Air Flotation (DAF) separator is a significant innovation in water and wastewater flotation technology. Simple in concept, it "folds" the flow by removing effluent from the same end of the tank as the influent is introduced. This results in a higher hydraulic loading rate.

The Folded Flow DAF hydraulic design takes advantage of the density gradients and currents inherent in every flotation process, and by doing so, it optimizes tank hydraulics. The result is an efficient separation process with advanced performance capabilities. The Folded Flow DAF works in a small footprint while maintaining the superior float concentrations and energy efficiency of the DAF process. This is the most important improvement in the DAF process since Xylem pioneered its use for oil, grease and TSS removal in the 1950's.
In all DAF designs, the influent is mixed with countless micron-sized air bubbles as the flow enters the tank. This effervescent mixture is less dense than bubble-free water. As a result, a "density current" is created, which tends to rise and spread quickly along the DAF surface.

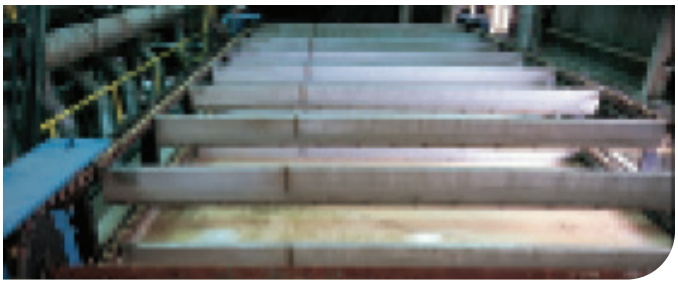
In the Folded Flow system, as the density current travels laterally, clean water, being heavier, peels away from the bottom of the density current and flows downward (See Figure 1). At the bottom of the tank, the downward flow gathers in a laminar fashion to form a horizontal return current, which accelerates as it nears the outlet.

The downward velocity of liquid from the surface layer to the return stream at the bottom is relatively constant along the length of the tank, and is uniformly close to a minimum flow. This assures that bubbles are moving upward throughout the entire volume of the tank.
By contrast, in a typical rectangular DAF design, influent enters at one end of the tank and effluent exits the other. With conventional designs, the density current creates a large, recirculating volume of bubble-free water in the center of the separator (See Figure 2). As a result, much of the volume of the tank is underutilized and the effective time for the bubbles to remove contaminant's is limited as the density current flows past the "dead" recirculating zone.

Xylem has performed dye tracer studies, which demonstrate the improved hydraulics of the Folded Flow system. Details of the studies are available from Xylem.



Folded Flow separator pilot units are available for test purposes. This test unit is easily connected to existing plant lines and will quickly demonstrate the suitability of Float-Treat and help establish design criteria for the full scale plant.



The clear effluent, separated float and influent flow can be seen from the head end of a Folded Flow DAF separator.

Hydraulically utilizes entire water volume

Components

Folded Flow DAF separators use the same proven components found in other DAF separators designed and manufactured by Xylem, which is considered to be the industry standard.

In operation, a portion of the effluent is pumped to a pressurized air saturation tank where the maximum quantity of air is dissolved using an efficient vertical pressure tank. The air saturation system conforms to rigid code requirements and has been thoroughly proven in hundreds of installations. Baffles in the air saturation tank maximize dissolution while preventing fouling. Low pressure design contributes to lower costs.

The pressurized recycle is then combined with the influent flow and enters the DAF tank in a maintenance-free, non-plugging arrangement.

For strength and operating longevity, non-metallic surface and bottom chain with stainless steel or fiberglass flights run over polymeric sprockets. Drives have safety enclosures, are rated for continuous operation and are sized to start-up under worst case conditions.

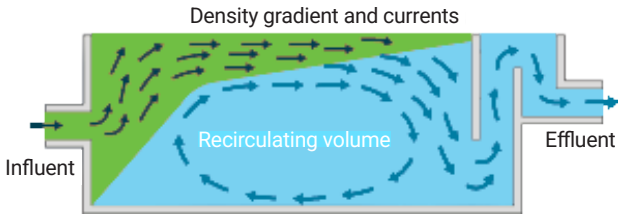


Figure 2. Density currents developed in a conventional DAF separator lead to inefficient use of available tank volume and display a greater potential for short circuiting, especially at higher than normal hydraulic loadings.

Xylem designs and manufactures the steel tanks. Tanks can be shipped completely assembled with all components installed, or as modules. If required, the system will be supplied with flash mixing and flocculation.

As with conventional DAF separators, the selection and sizing of Folded Flow DAF separators should be based upon bench testing and/or pilot studies. With a fleet of DAF separator pilot units, its own laboratory and skilled technicians, Xylem is well suited to perform these services and to ultimately offer a process guarantee.

Prior to testing, however, the following comparison chart can serve as a guideline to the strengths and weaknesses of the different separation processes.

Comparison of air flotation processes

Features	Conventional DAF	Folded Flow DAF	Conventional IAF
High overflow rate		X	X
Small footprint		X	X
Low cost		X	X
Easy to cover	X	X	X
Excellent oil and grease removal	X	X	X
Excellent TSS removal	X	X	
High float concentration	X	X	
Easily handles settled solids	X	X	
Tolerant of large flow changes	X	X	
Tolerant of large concentration changes	X	X	

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1) the tissue in plants that brings water and nutrients upward from the roots.
2) a leading global water solutions company.

Xylem is a leading global water solutions company dedicated to advancing sustainable impact and empowering the people who make water work every day. Xylem connects diverse capabilities and innovative technologies to provide tailored solutions across the entire water cycle. From moving, treating and measuring water to optimizing and maintaining water systems, Xylem collaborates with customers to solve their most critical challenges. Together, through partnerships with utilities, industrial manufacturers, building operators, and communities, we are building a more water-secure world.

For more information on how Xylem can help you, visit xylem.com.

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