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Water Solutions

# Folded Flow<sup>®</sup> Dissolved Air Flotation Separator

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# Folded Flow<sup>®</sup> — The Next Generation DAF Separator

The Folded Flow<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> DAF process 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 its initial 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<sup>®</sup> design, 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.

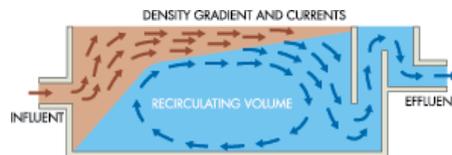
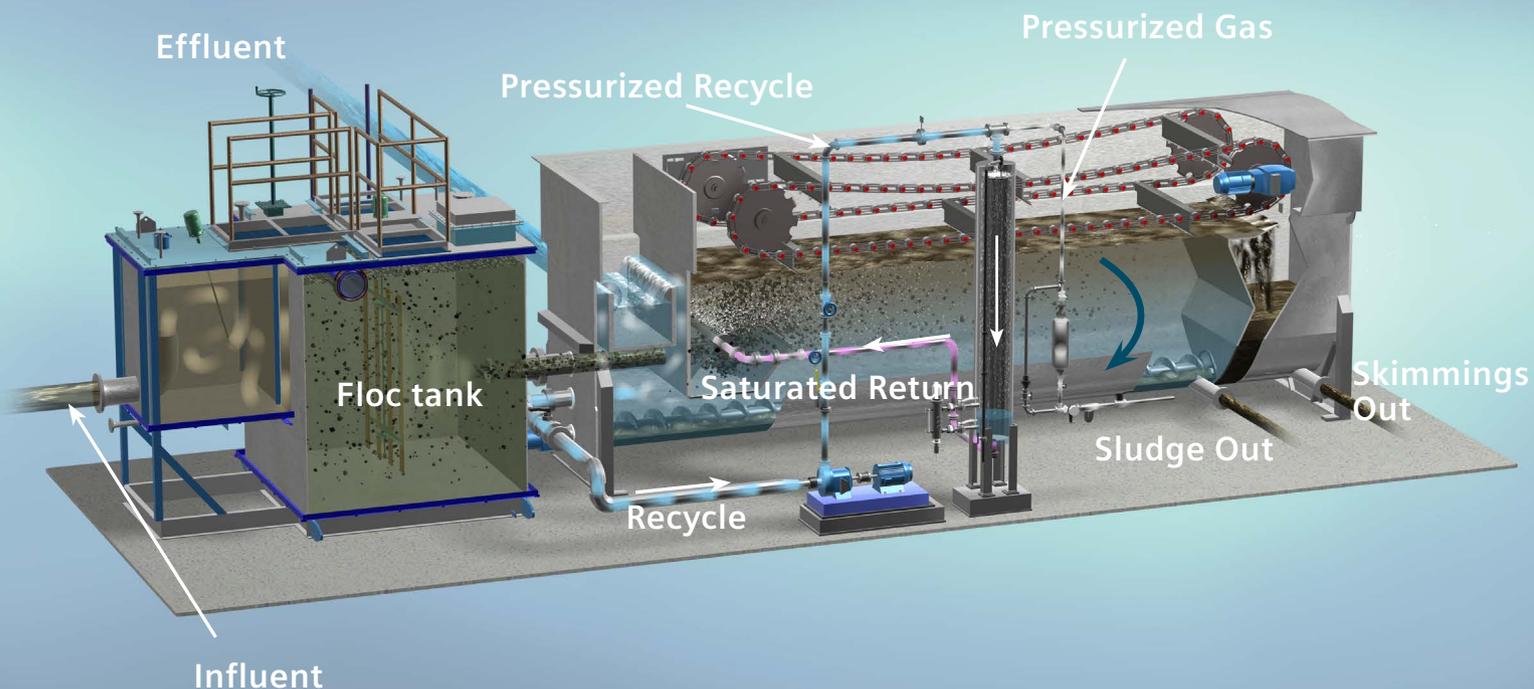


Figure 1. Density currents developed in a conventional DAF separator lead to inefficient use of available tank volume and display a greater potential for short circuiting, especially at higher than normal hydraulic loadings.



# Folded Flow<sup>®</sup> DAF — Hydraulically Uses Entire Volume

Siemens Water Solutions has performed dye tracer studies which demonstrate the improved hydraulics of the Folded Flow<sup>®</sup> design. Details of the studies are available upon request.

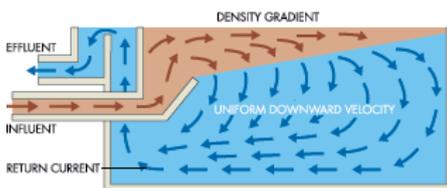
In operation, a portion of the effluent is pumped to a pressurized air saturation tank where the maximum quantity of air is dissolved using an efficient vertical pressure tank. The air saturation system conforms to rigid code requirements and has been thoroughly proven in hundreds of installations. Baffles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

Drives have safety enclosures, are rated for continuous operation and are sized to start-up under worst case conditions.

Steel tanks can be shipped completely assembled with all components installed, or as modules. If required, the system will be supplied with flash mixing-flocculation. Additionally, Folded Flow<sup>®</sup> DAF separators can be installed in concrete tanks if required.

As with conventional DAF separators, the selection and sizing of Folded Flow<sup>®</sup> 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, Siemens is well suited to perform these services and to ultimately offer a process guarantee.



*Figure 2. 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<sup>®</sup> 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 the process and help establish design criteria for the full scale plant.*

*Clear effluent, separated float and influent flow are able to be seen and monitored in the Folded Flow<sup>®</sup> DAF separator.*



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Siemens Energy, Inc.  
301 West Military Road  
Rothschild, WI 54474  
USA  
Phone: +1.715.359.7211  
E-mail: [water.energy@siemens.com](mailto:water.energy@siemens.com)

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