



## Suspended Air® Flotation (SAF®)

Suspended Air® Flotation (SAF®) is like other wastewater treatment systems that remove solids with flotation. This is where the similarities end. **SAF® does not dissolve or induce air in water.** SAF® eliminates the challenges inherent to dissolved air systems, providing significant benefits in performance and economies of design and operation.

### SAF® Advantages

- ✓ Cleaner effluent
- ✓ Smaller footprint
- ✓ Competitive capital cost
- ✓ Lower operational cost
  - Less energy consumption
  - Less chemical cost
  - Less maintenance
- ✓ Less operator attention
- ✓ Less water in skimmed solids
- ✓ Easier installation and start-up
- ✓ Works with high temperature water
- ✓ Convert an existing DAF to SAF®
- ✓ Increased design throughput (hydraulic loading) and solids float per ft<sup>2</sup> (solids flux)

Traditional DAF systems are based on dissolving air under elevated pressure (40-120 psi) in a water recirculation loop drawn from the underflow of the float cell. When this pressurized stream re-enters the float cell at atmospheric pressure, the dissolved air returns to the gas phase, forming air bubbles to lift solids. With dissolved air systems, the water used for dissolving air to create “white water” is drawn from the float cell. This water is inherently laden with waste solids. Solubility of air in water decreases rapidly with increasing temperature and contaminate concentration and can range from less than 2% to 5%. Typical process water is rarely cool or clean, in many instances dissolved air concentration is often less than 2%.

When dissolved air comes out of solution to form bubbles (like soda pop), the bubbles will quickly coalesce to make larger bubbles. This coalescing results in less surface area to lift solids and shorter bubble life. Moreover, DAF bubbles have a slightly hydrophobic property, decreasing efficiency for binding solid particles (contaminants).

Instead of using pressurized air, a SAF® generator makes a froth made up of apherons (electrostatically charged microbubbles) produced at atmospheric pressure. This froth is injected into the wastewater influent stream immediately ahead of an in-line mixer. The mixer is located ahead of a float cell after the serpentine style flocculation tubes. As the influent enters the float cell, the charged microbubbles very effectively attach and lift suspended solids to the surface. The floated solids are then mechanically skimmed and pumped to disposal.

SAF® froth contains >40% air because it is not subject to the physics of dissolving air in solution. SAF® bubbles have a surfactant sheath creating an affinity for contaminants. Combined with a very small bubble size, surface tension advantages and resistance to coalescing, SAF® “white water” has vastly greater surface area for solids capture, a higher affinity for solids in solution, faster rise rates, and a more robust float.



### **SAF® Aphrons (charged microbubbles)**

Aphrons are tiny microbubbles (7 to 25 microns) which compose the SAF® froth. The charge of the froth can be tailored to waste stream characteristics, i.e. opposite that of the chemistry used to flocculate the solids. Because opposites attract, the aphrons have an electrostatic attraction to the wastewater solids. This electrostatic charge significantly improves solids capture and removal, including increased colloidal solids capture.

The surfactant used in the production of the SAF® froth is made from a naturally occurring source, is certified GRAS (Generally Regarded as Safe), and is safe for use with potable water (NSF60 Certified). SAF® systems are installed and used in numerous applications upstream of secondary wastewater treatment systems and have proven to have no detrimental impact on bio-fermentation processes.

### **Equipment Footprint**

New SAF® installations require a much smaller float cell than traditional DAF systems. Both hydraulic and solids loading rates are considered for sizing. Heron Innovators has installations operating with a Total Suspended Solids (TSS) loading rate (solids flux rate) as high as 40 lbs/ft<sup>2</sup>/hr.

The froth generation skid will be sized for the application, with the largest model having a footprint of 6'x6'. This skid can be located remotely where floorspace is available.

Additionally, due to the greater solids float per ft<sup>2</sup> (solids flux) capacity, a complete wastewater treatment system requires 1/10<sup>th</sup> the footprint of traditional flotation methods. Heron Innovators, Inc. manufactures wastewater treatment systems ranging from 25 gpm to over 8,000 gpm of wastewater.

### **Energy Requirement**

SAF® systems have a very low energy requirement. As an example, a system designed for flows up to 4,500 gpm require only 10 HP (7.4 kW). A comparably sized DAF system can require recirculation pumps and air compressors totaling more than 200 HP (150 kW). In retrofit applications, the existing dissolved air system pumps and compressors will be turned off and can be disconnected and removed. Significant reduction in system maintenance and improvement in equipment operational availability (up-time) is therefore also realized with SAF®.

### **Waste Water Chemicals**

Polymer and coagulant must still be used to flocculate suspended solids; however, SAF® provides significant reduction in the amount of conditioning chemicals required. Case studies documenting projects with an ROI of less than one year to as little as one month are available on the Heron website. [www.heroninnovators.com](http://www.heroninnovators.com)



### **Floated Solids**

SAF® produces a thicker, more stable float with more air and less water. After the solids have been skimmed and pumped and the air eventually releases, there is less to dispose by weight. If you experience an interruption in your wastewater flow, the SAF® solids will float considerably longer compared to DAF. This allows for ease of operation in start and stop conditions.

### **Retrofitting an Existing DAF**

Heron Innovators has over 100 installations with many being retrofit conversions from DAF to SAF®. Often the driving reason for a retrofit is that the existing DAF is performing inadequately, resulting in POTW surcharges or secondary waste treatment challenges. Other retrofits have been to save on power and chemical costs.

A SAF® retrofit is as simple as turning off the dissolved air system and adding a SAF® generator with an in-line mixer. Heron Innovators offers several options for lab and pilot testing to verify efficiencies and performance.

A SAF® retrofit of an existing DAF has proven to increase the solids removal capacity by more than 5X.

### **New SAF® Systems**

For greenfield/brownfield applications, Heron Innovators, Inc. offers very competitive turnkey solutions.

Heron also offers a unique skid mounted “plug and play” solution with all the necessary equipment for wastewater pre-treatment including polymer preparation and pH adjustment. All plumbing, wiring (primary and secondary), and testing is performed at the factory for quick installation and commissioning. PLC automation is provided for automatic start-up and shut-down, minimizing operator attention in intermittent service applications.

SAF® is an excellent technology for wastewater pre-treatment, digestate concentration, algae removal, secondary biosolids, and many other solids removal applications.

### **Case Studies**

Many documented case studies quantifying benefits in various applications are accessible on our website under the “about SAF®” menu.