



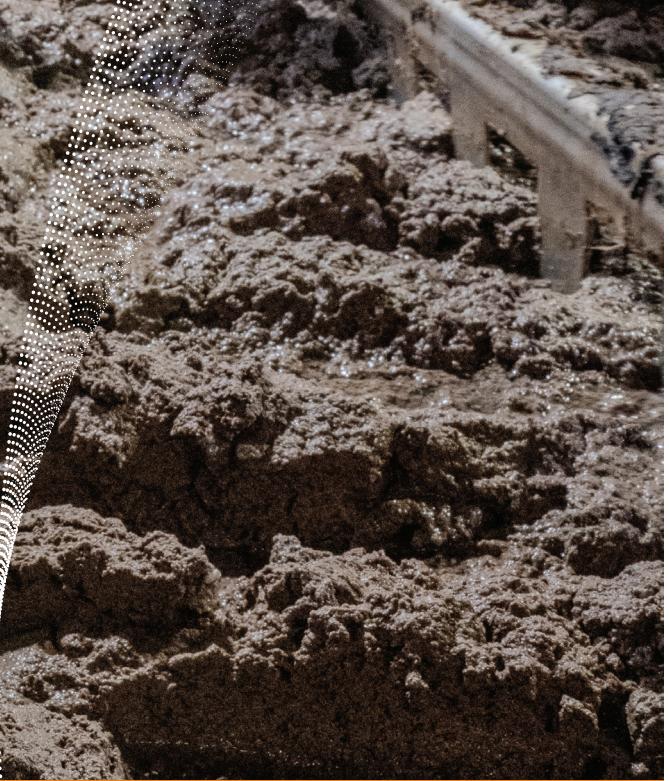
SIGMA
EQUIPMENT SUPPLY & SERVICES

K Komline
Heron

SSAF

Suspended Air[®] Flotation (SAF[®])

Proven Colloidal Gas Aphon (CGA)
Technology Since 1998



SAF® Solution: Thickening

High Performing Solids Removal

Selecting a wastewater treatment design can be complicated by the system's operational costs, its performance, and the facility's physical footprint. Komline-Heron's Suspended Air® Flotation (SAF®) has been demonstrated to outperform more conventional technologies such as dissolved air flotation for thickening (DAFT), rotary drum thickeners (RDT), and gravity belt thickeners (GBT) for waste activated sludge (WAS), activated sludge mixed liquor, and anaerobically digested sludge within a small footprint.

Unlike DAF, which uses dissolved air under pressure to remove solids and contaminants from wastewater, Komline-Heron's SAF® uses colloidal gas aphon (CGA) technology. The SAF® process generates a suspension of electrically charged micron-sized (5-25 μ m) air bubbles at atmospheric pressure (CGA). This unique combination created outside the flotation cell gives SAF® bubbles increased surface tension keeping the bubbles stable and uniformly small, maximizing surface area for contact. Meanwhile, the charged layer creates an electrostatic affinity with oppositely charged or neutral particles in the water. Together, these properties drive rapid and reliable attachment, allowing SAF® bubbles to attract, bind to and lift suspended solids. These interactions result in efficient flotation, driving particles to the surface where they are easily removed.

While both DAF and SAF® use flotation to separate solids and liquid, SAF® does not require pressurization or recirculation to create the CGA froth. SAF® delivers 40% air by volume to the treatment process, compared with DAF's 2-4%. While DAF technology tends to produce bubbles that merge into larger ones, SAF® microbubbles are engineered to resist coalescence. This stability preserves a dramatically higher total surface area, enhancing solids capture, accelerating rise rates, and producing a stable, more robust float.

There are also marked operational differences between SAF® and DAF technologies. In most applications, SAF® has a 10-fold increase in solids loading over DAF. SAF® can handle high and variable concentrations of suspended solids of up to 2% or 20,000 Mg/L, and SAF® is simpler and faster, consumes less energy, and requires less time to process solids in a reduced footprint.

"The ability to achieve high performance under a wide range of feed sludge conditions has made the SAF® an indispensable tool for managing the anaerobic digestion process."

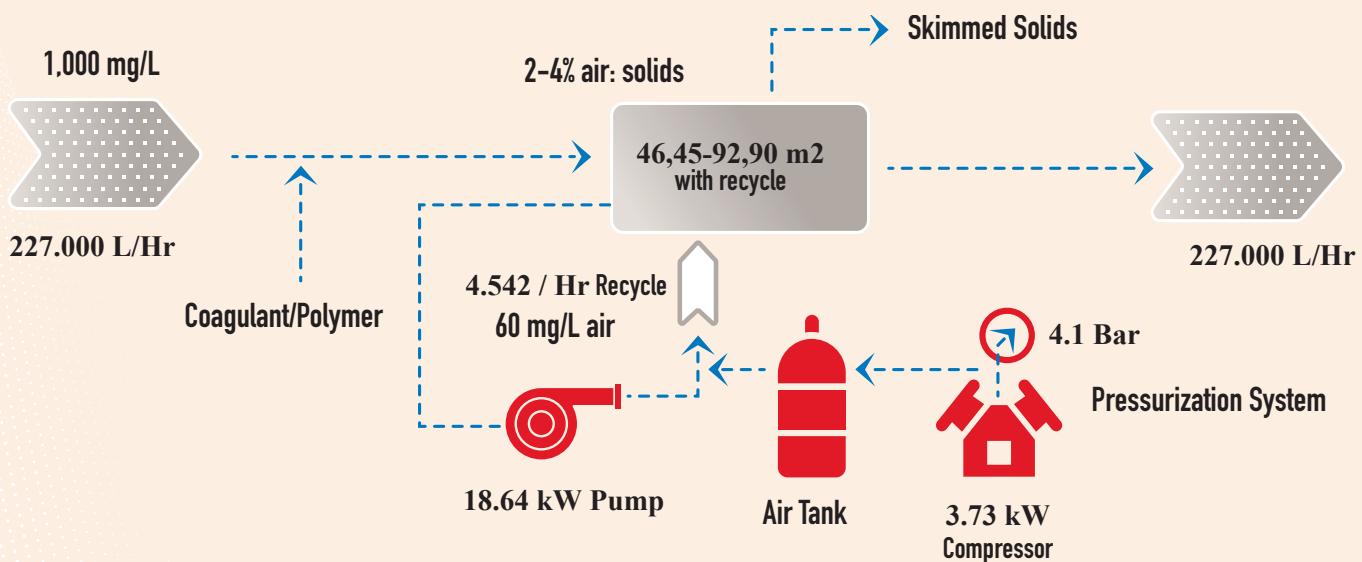
Harold Leverenz, Ph.D., P.E.,
author of "THICKENING ACTIVATED SLUDGE WITH SUSPENDED AIR® FLOTATION (SAF®)"
Summary of three case studies"

Komline-Heron can easily convert an existing DAF for any application by adding a SAF® Generator and a ClearMixer®.

Conversion results are clear:

- **Increased capacity for hydraulic loading and solids**
- **Improved separation for cleaner effluent**
- **Dryer skimmed float**
- **Reduced operations, energy and maintenance costs**
- **Start-up within minutes not hours**

Dissolved Air Flotation (traditional models)



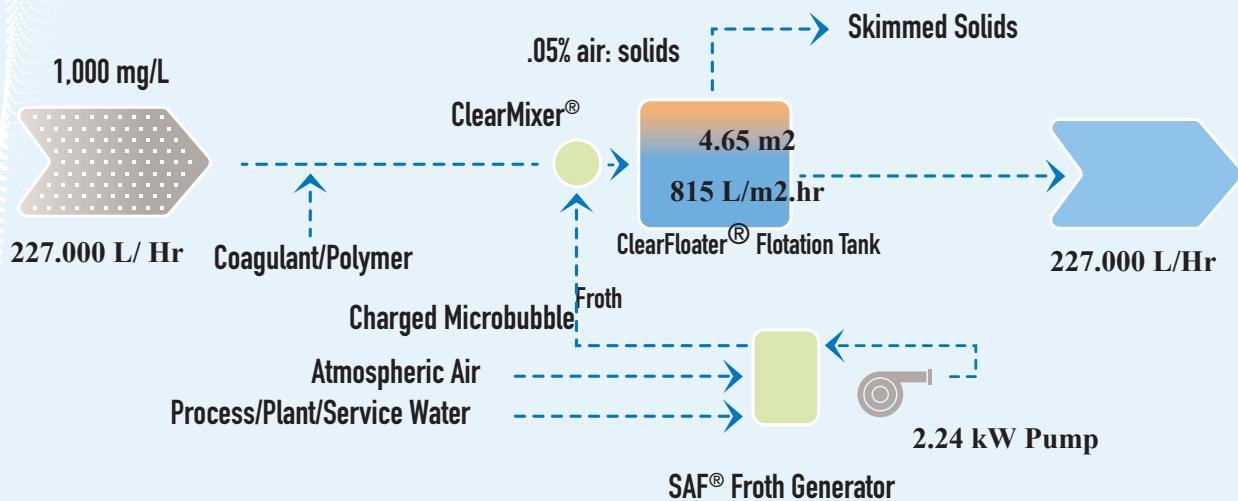
CASE STUDY



Scan to see
the case study

The **Warminster, Pennsylvania Municipal Authority's** wastewater facility had used a DAF process to thicken solids in the range of 3.5 to 4.5%. The low concentration of solids in the thickened WAS affected solids retention times in the anaerobic digesters. Also, due in part to mixing limitations within the digesters, foaming events occurred. The municipal authority replaced the DAF with a SAF® unit, and the thickened solids increased to 5.5%, which improved the digestion process and eliminated the foaming problem.

Suspended Air® Flotation (SAF®) by Heron Innovators



SAF® Solution: Clarification

Superior Clarification for Cleaner Effluent and Cost-Efficient Operations

Municipal and industrial wastewater treatment typically involves separate systems for primary clarification, secondary clarification and thickening, and tertiary polishing. Suspended Air® Flotation (SAF®) can be applied effectively at each of these stages. It functions as a primary clarifier, combines clarification and thickening in the secondary position, and provides final polishing prior to discharge or reuse. With the SAF® technology, thickening and clarification occur in one integrated system. SAF® does this using a Suspended Air® froth generator. The froth is comprised of colloidal gas aaphrons (CGA) — trillions of tiny bubbles delivered at atmospheric pressure. When the influent moves through the system it is conditioned with polymer and coagulant and then through a serpentine style mixer before entering a ClearMixer® attached to the flotation cell.

The ClearMixer® is an in-line mixing chamber in the SAF® process, where the externally generated CGA froth is injected and gently stirred into the influent, driving the bubble-to-particle reactions before the flow enters the flotation cell. The solids rise to the top immediately and are then scraped off into a hopper. Solids can be further dewatered by gravity if they're needed for other uses, such as fertilizers.

Thanks to its rapid flotation mechanism, SAF® supports significantly higher hydraulic loading rates than conventional systems without compromising performance. Its ability to remove high concentrations of total suspended solids (TSS) and fats, oils, and grease (FOG) also drives substantial biochemical oxygen demand (BOD) reduction, often eliminating the need for separate treatment steps. The compact footprint, lower chemical demand, and minimal maintenance requirements make SAF® a practical and cost-efficient choice for both conversions and new system designs.

CASE STUDY

The **City of Austin, Minnesota** conducted a pilot study of both DAF and SAF® in 2020 for industrial wastewater separation. The SAF® system outperformed the DAF system on several fronts, beginning with system setup, which demanded more time for the DAF. In repeated tests of influent and effluent, SAF® yielded a higher average percentage of total suspended solids (TSS). Operationally, SAF® was more reliable, easier to operate, recovered more quickly from failures, ran more quietly, and did a better job handling changes in total suspended solids than DAF. The greater need for chemicals and for a larger footprint made DAF 25% more costly than SAF®.



Scan to see
the case study





Photo Credit: Brian Macmanus, PE, General Manager,
East Rio Hondo Water Supply Corporation

CASE STUDY



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the case study

In the small **Sonoma County** town of Graton, for example, state officials told town officials that it could no longer discharge from its oxidation and settling ponds into the Atascadero Creek because of excessive algae and bacterial growth. The newly formed Graton Community Services District got to work, piloting solutions. They determined that if they used the more conventional **DAF** technology, they'd have to recycle 50% of the flow they were trying to produce, but with **SAF®**, they would only have to recycle 2%.

That meant less pumping and material handling, as well as needing smaller pipes. It also proved highly effective. **SAF®** consistently achieved effluent turbidity well below the state's Title 22 requirement of 2 NTU, and the district reported a total suspended solid removal of more than 98% and a 92% reduction in biological oxygen demand. Graton's treated water can now be used by local agricultural producers, offsetting the demand for groundwater and stream resources in the region's watershed.



➤ SAF® Specifications and Products

SAF® System	Flow Capacity					Float Area		Horsepower		
	GPM	MGD	LPS	M3/D	BPD			SAF®	Feed Pump	Solids Pump
CF25	50	0.072	3	273	1,630	5	0.5	3.75	1.5	3
CF50	125	0.180	8	681	4,347	10	0.9	3.75	3	3
CF125	350	0.504	22	1,908	11,955	17	1.6	6.00	5	3
CF250	700	1.008	44	3,816	23,911	35	3.3	6.25	10	5
CF375	1,000	1,440	63	5,451	34,236	50	4.6	9.50	15	5
CF500	1,400	2.016	88	7,631	47,822	72	6.7	17	15	5
CF750	2,100	3.024	132	11,447	71,734	105	9.8	18	25	7.5
CF1000	2,800	4.032	177	15,263	96,188	144	13.4	28	40	15
CF1500	4,500	6.480	284	24,530	154,336	225	20.9	29.50	50	15
CF2001	6,000	8.640	379	32,706	205,963	300	27.9	35	75	25
CF3001	8,000	11.520	505	43,608	274,437	400	37.2	36	100	30

Now part of Komline, Komline-Heron continues to bring personalized service, expertise, and the agility of a small company to every customer, backed by a global powerhouse in water and wastewater treatment for robust technical resources and long-term stability.

Suspended Air® Flotation (SAF®): Your Solution for Water and Wastewater Management

Komline-Heron Delivers Quality, Efficiency, and Cost Savings

Innovating the field of water treatment technology since 1998, Komline-Heron produces better and immediate results. SAF® is a versatile clarification and thickening technology designed to remove total suspended solids (TSS), fats, oils, and grease (FOG), and biochemical oxygen demand (BOD) across a wide range of water and wastewater types. It is effectively applied in municipal systems for primary clarification, secondary solids thickening and removal, and reuse polishing; in industrial facilities handling food and beverage, protein processing, and pulp and paper; and in challenging waters from mining and oil and gas operations. Whether the goal is meeting discharge limits, recovering product, or improving downstream reliability, SAF® delivers high-efficiency performance in a compact system that is simple to operate and requires significantly less maintenance.

“It just works!”

Andy Brashear, Environmental Manager, Simmons Foods



Scan to see the case study

SAF® Advantages:

- **Less equipment:** Requires only a SAF® generator and ClearMixer®
- **Easier installation and startup:** Plumbed, wired, and tested, with flotation and ancillary equipment on a single skid
- **Compact footprint:** Uses about 1/10th of the space of DAF
- **Conversions from DAF:** Better separation, increased hydraulic flow and solids loading capacities, dryer skimmed float, reduced costs and cleaner effluent
- **Cost savings:** Requires fewer chemicals, less energy and less maintenance
- **Reliable:** Manages changing water conditions and is resilient to load changes

Clarify more.
Remove more.
Expect more.