IL
INDUSTRIAL LAUNDERER
FOR THE UNIFORM & TEXTILE SERVICE INDUSTRY
JULY 1994

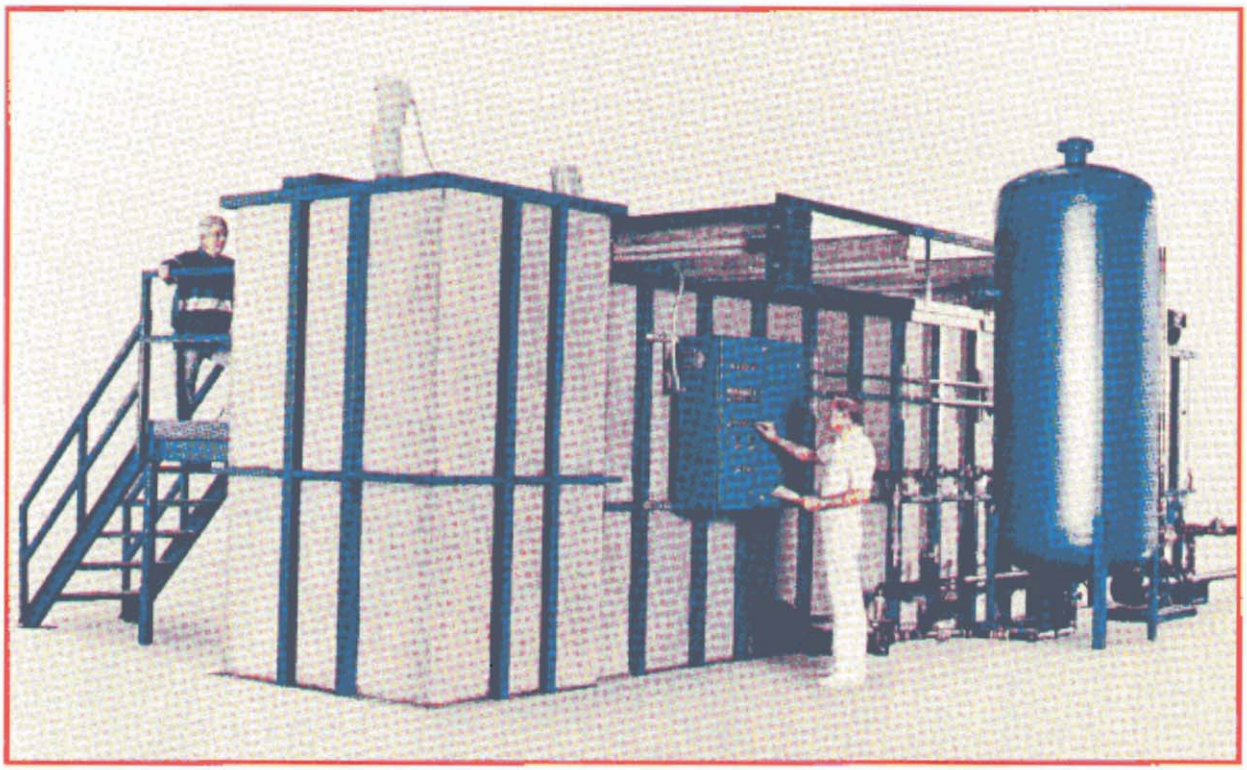
INDUSTRIAL LAUNDERER says:

"KEMCO ENGINEERS REVOLUTIONIZE DAF"

Full text of INDUSTRIAL LAUNDERER's July, 1994 article featuring KEMCO's recently introduced Dissolved Air Flotation (DAF) component of the KEMCO Waterkare wastewater treatemtn system.

Water Systems Engineers Revolutionize DAF Concepts

Kemco concluded that minimum turbulence and maximum bubbling make the most of dissolved air flotation. Add a few other twists, and the result is a better quality sludge blanket and clearer effluent



Exterior view of Kemco's new Waterkare wastewater treatment system.

A recognized leader in water systems engineering for the laundry and textile industries has redesigned dissolved air flotation (DAF) for higher levels of performance and cost effectiveness in wastewater treatment.

"We've taken conventional DAF, the process recognized by laundry and textile managers as 'the most cost effective wastewater clarification treatment' to new and even higher levels of performance," says Lee R. "Skip" Kemberling, CEO, Kemco Systems, Inc., Clearwater, Fla.

"We did it by redesigning and reengineering the dissolved air injection process across the entire length and width of the DAF tank. Conventional DAF units limit air injection to a single point, but ours spreads it, like a grid, throughout the entire width and length of the tank."

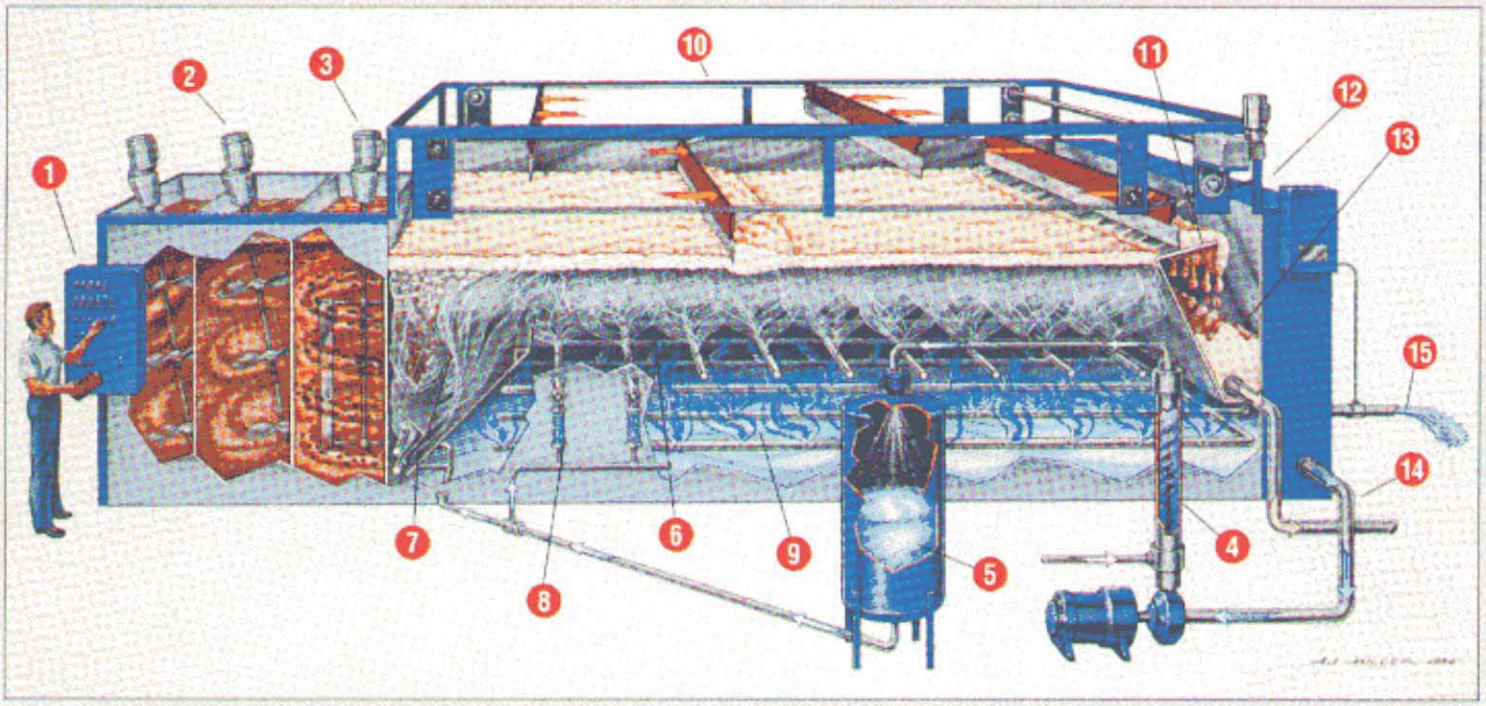
Oversimplified, all DAF systems inject a solution of dissolved air (microscopic bubbles of air-like fizz in soda pop) into the chemically pretreated wastewater as it enters the DAF tank. This "whitewater" attaches to suspended waste solids, or floc, and floats it to the surface. Separated floc is then skimmed from the liquid.

Kemco Systems engineers studied the theory of DAF and concluded that the minimum amount of turbulence within the tank, and the maximum amount of microscopic air bubbles distributed to rise evenly throughout the tank, would combine to produce the highest quality sludge blanket and clarified effluent.

"First, we revolutionized the air/water saturation process," explains Kemberling, "to achieve the best whitewater quality. Next, we revolutionized the blending of whitewater and wastewater, so it mixes with the least amount of turbulence. We also reengineered and revolutionized whitewater/wastewater blending—across the entire width and length of the tank."

In addition, "We employed 'technology transfer' from our successful water heating/heat reclamation equipment to revolutionize the 'counter flow' of air bubbles to float or separate suspended solids for the purest effluent possible.

"Particulate just cannot penetrate the



Inside Kemco's DAF Design

1. Advanced process logic controller (PLC).
A PLC computer facilitates operation and control of all DAF system processes—for accuracy, timing of multiple procedures, and sequential merging of all operations. Also available: Options to monitor and report chemical and energy consumption, record effluent characteristics, and more.

2. Optimal mixing of chemicals.
To increase DAF performance and effluent quality, chemical processes and pH neutralization require specific time and volume controls. Kemco chemical reaction tanks have ample volume to ensure completion of the chemical reaction before entering the next step of the process. Ample tank size and mixing reportedly keep chemical costs to a minimum.

3. Flocculation.
Following chemical/pH treatment, floc is "prepared" for maximum liquids/solids separation. A variable speed flocculator, with Kemco's unique "mixer," assures ideal floc particle size. Specifically designed tank volumes optimize polymer enhancement before introduction to the DAF process, Kemco says.

4. High turbulence flash-mixing.
The primary air/water mix is swirled through Kemco's exclusive Turbulator, where the water becomes super-saturated with air.

5. Micron-sized bubbles.
The super-saturated air/water solution is equalized and homogenized in a high pressure chamber. High-turbulence mixing and high- pressure equalization assure uniformity of microscopic air bubbles in the water.

6. Full float screen.
Multiple whitewater injection points form a grid throughout the entire length and width of the clarification/separation area, creating a full blanketing screen of microscopic air bubbles to continuously float and re-float the floc.

7. Smooth conflux of waste floc and whitewater.
Flocculated waste stream flows into the firm's full-width diverter/deflector chamber. Across the entire width of the DAF, it merges smoothly with whitewater (microscopic air bubbles coming from the pressurized solution). Unlike single-point floc/feed diffusers, the floc/whitewater merging process is spread across the DAF's full width. Result: near zero turbulence; high air-to-solids ratio, Kemco says.

A second stage of floc/whitewater confluence, across the entire width of the DAF, assures total solution mix. "Lazy" floc particles are recharged by additional white water to assure complete flotation.

8. Multiple flow meters.
Flow meters allow proportioning of whitewater to treated water flow at each section of the clarifier tank.

9. "Anti-channeling" effluent manifold.
To maximize the effectiveness of the whitewater-injection/full-float design, the effluent manifold creates a grid that guarantees a total area "counter flow," positively blocking any particulate from entering the clarified effluent discharge system.

10. Independent skimmer frame for trouble-free life.
Skimmer frame is self-contained, separate from the DAF assembly. Like a solid steel auto frame (as opposed to cost-cutting unibody), it's stronger, provides true tracking for sprockets, chain and skimmer blades, and promises longer life and lower maintenance.

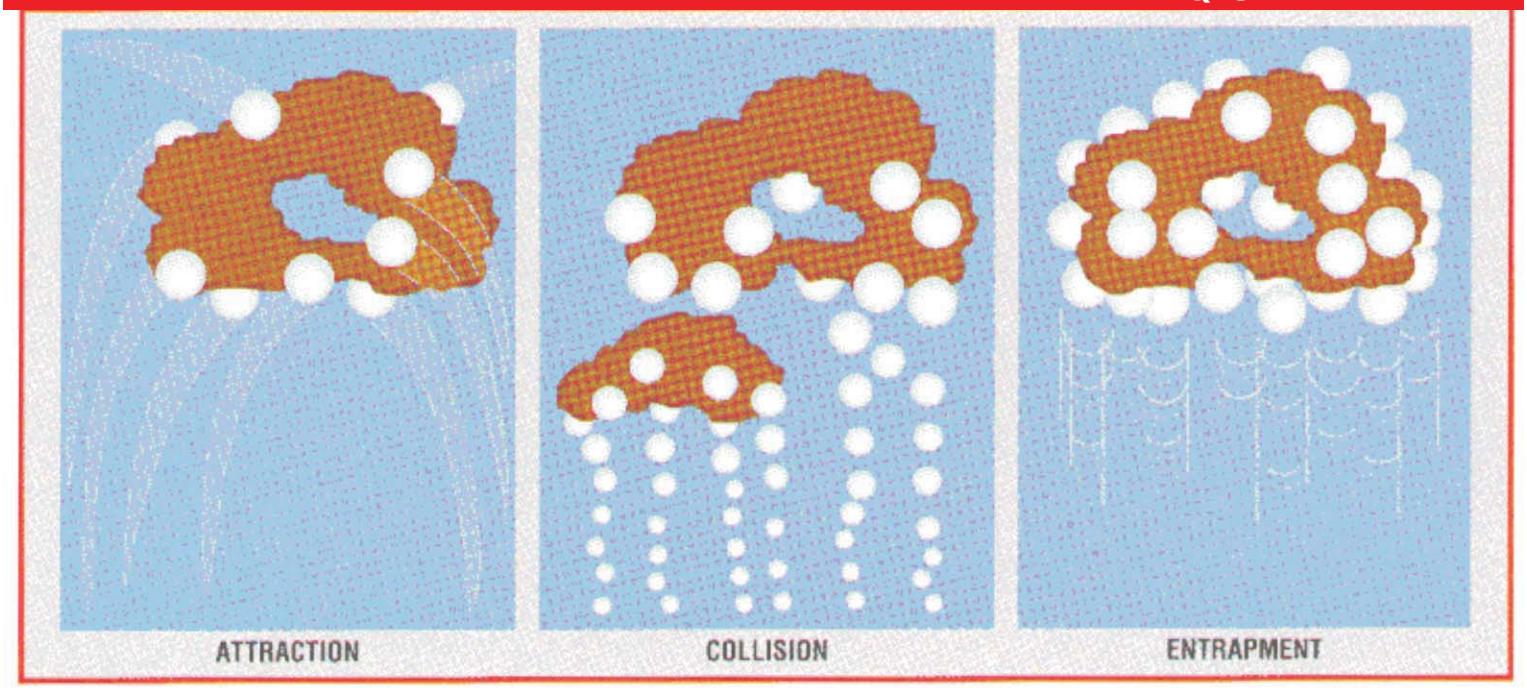
11. Float skimmer drive parallels sloped beach.
Angled skimmer drive design allows increased skimmer contact, with a much longer beach than other systems, for maximum water reduction. Adjustable height skimmer blades are said to provide better dewatering control based on float thickness.

12. Adjustable Weir gate.
This gate (designed like a knife valve) controls the tank level. It can be easily and quickly adjusted to suit varying thickness of the float, minimizing its water content for maximum sludge removal.

13. Ample sludge collection/ storage chamber.
Sludge collection is integral to the DAF clarifier and includes controls to activate transfer of the sludge to conditioning or disposal operations.

14. Clarified effluent recycled.
Previously treated (clarified) water is recycled in the air/water saturation process. High pressure air is injected into pressurized water (primary air/water saturation).

15. Treated effluent.
The treated wastewater stream will be piped to future process reuse/recycle system or discharge from the plant.



air blanket, so only water positively uncontaminated with particulate can reach the effluent grid. Our DAF does not require a bottom sludge conveyor or drag because there is no way particulate can pass the air screen."

Kemco is marketing the technology as the Waterkare Guaranteed Wastewater Solution system. It's seen as a logical extension of the company's efforts to be the market leader in water systems engineering—from preheating fresh water with wastewater energy; to complete water management in laundry, textile, food processing, and industrial plants; and now, to wastewater treatment clarification, reuse and sludge processing.

How DAF Works

Air, dissolved under pressure in water, comes out of solution when released to normal atmospheric pressure. In DAF systems, ionically charged air bubbles attach to suspended solids, or floc, through attraction, collision, and entrapment.

Attraction. Rising ionically charged air bubbles are attracted to the surfaces of the separated floc solids, lowering specific gravity, causing the floc to rise to the surface.

Collision. Rising air bubbles collide with floating solids, creating an air-to-solids bond, raising the floc to the surface.

Entrapment. Rising air bubbles, entrapped within floc structure, further lower specific gravity and raise floc to the surface.

The separated and floated floc is then skimmed from the liquid.

This principle is used in all DAF systems. A key difference between Kemco's counter flow system and others, the firm says, is visible in other systems' half-ellipse pattern of mixing, which produces lower floc-loading, higher costs, and lower efficiency. A single point influx often causes turbulence and only partial flotation, resulting in higher run times and costs. Parallel flow of wastewater and whitewater is less effective.

With Kemco's counter flow design, the waste stream floc is initially and continuously floated and re-floated for highest performance and lowest total cost. Counter flow of wastewater and whitewater makes every foot count, for greater capacity and efficiency.

Other DAF systems require bottom sludge conveyors to discharge what their float didn't float, Kemco notes. Full float usually assures maximum extraction of wastewater floc. Some applications may require a sludge conveyor, but with the modular design, such an addition would be easy and reasonable in cost, the company says.

A single point influx often causes turbulence and only partial flotation.

Kemco's system is designed to effectively reduce biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), fats, oils, and grease (FOG), and heavy metals.

System attributes include solid stainless steel plate tank walls and bottom. Stainless steel is standard, although other grades can be ordered. Clarifiers are available in capacities from 5 to 1,000 GPM; because of the modular design, add-ons are said to be easily and economically matched to your requirements. This is seen as highly relevant as environmental restrictions become more stringent and adaptability and expandability become more important.

Before full-scale design of a custom-built system, Kemco can provide a scaled-down pilot operation in your plant. Then, operating under your specific wastestream conditions, data will be collected relevant to the final design of your DAF system.

This epitomizes the company's approach: to use its engineering and manufacturing team to deliver top quality modular design "packaged" systems with the highest performance and lowest operating costs available. No small order!