What’s a DAF ? And what’s it going to do for me?

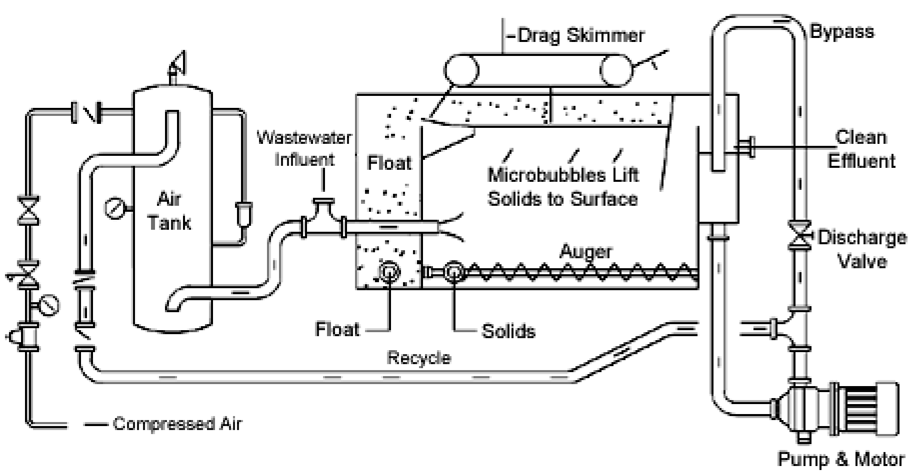
Dissolved Air Flotation (DAF) Theory:

Process overview

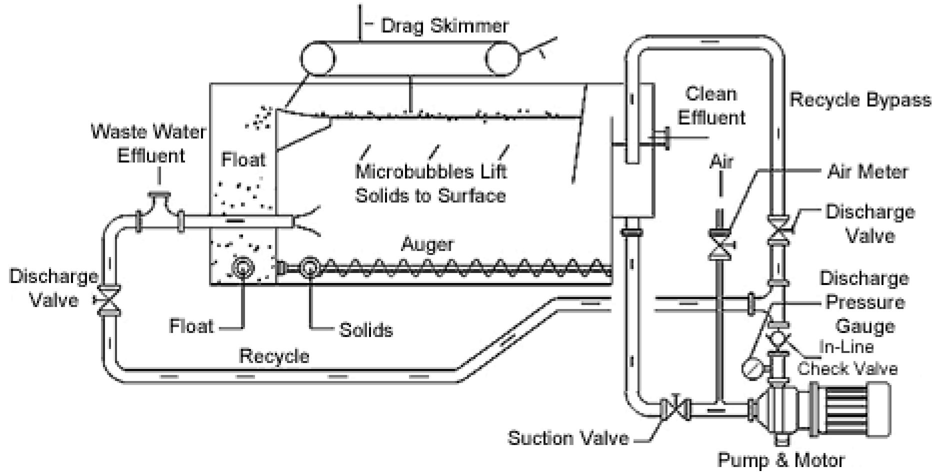
Dissolved Air Flotation (DAF) is the process of removing suspended solids, oils and other contaminants via the use of air bubble flotation. Air is dissolved into water, mixed with the wastestream and released from solution while in intimate contact with the contaminants. Air bubbles form, attach to the solids, increase their buoyancy and float the solids to the water's surface. A percentage of the clean effluent is recycled and super-saturated with air, mixed with the wastewater influent and injected into the DAF separation chamber.

The dissolved air comes out of solution, producing millions of microscopic bubbles. These bubbles attach to the solids and float them to the surface where they are mechanically skimmed and removed from the tank. SkimOIL's dissolved air flotation systems are designed to remove fats, oils & grease (FOG), suspended solids, food/animal production/processing wastes, industrial wastes, hydrocarbon oils/emulsions and many other contaminants. Clarification rates as high as 97% or more can be achieved using our dissolved air flotation systems. Chemical pre-treatment can often help to improve the performance of contaminant removal.

For Oil skimming a DAF can make more oil available on the surface sooner, for the skimmers to collect.



Conventional DAF saturation design uses a recycle pump combined with a saturation vessel and air compressor to dissolve air into the water. This type of system, while effective, is expensive, labor intensive and can destabilize its point of equilibrium, creating burps due to incorrect, loss or creeping of EQ set-point in the saturation vessel. This design is slow to recover and can upset the flotation process in the DAF. Air transfer efficiency is approximately 9% @ 80% entrainment. This style of operation can increase chemical use, labor costs, downtime, effluent loadings, production schedules and other detrimental domino effects due to EQ loss.



SkimOil's **DAF** design incorporates today's "state of the art" technology in DAF design.This design simplifies the DAF process, requires less startup time, less capital cost, instrumentation, labor and maintenance. The design is process friendly, providing virtually instant saturation upon system startup without equalization and complex startup procedures. Once the system is adjusted the system can be shutdown and started up again without any readjustment or equalization. Higher air transfer efficiencies are also realized due to higher saturation pressures with 12% @ 93% entrainment. SkimOil can provide both styles of DAF design depending on application and customer preferences.

DAF sizing takes into consideration many criteria for sizing:

- Flow rate
- Water temperature
- Waste characteristics
- Chemical pre-treatment
- Solids loading (LBS/HR/Ft2)
- Hydraulic loading (GPM/FT2)
- Air to solids ratio (LBS of air/LBS of Solids)

DAFs are designed on the basis of the peak flow rate expected. The flow can range from 1 to 5 gallons per minute per square foot of surface area (GPM/Ft2). Bench testing of waste stream samples is usually the preferred starting point when sizing equipment and determining proper chemical processes prior to the DAF. The chemical pretreatment will assist and improve the DAF separation process.

Chemical Pretreatment often improves DAF solids removal efficiencies. The use of chemical flocculants with DAF is based on system efficiency, application (use of DAF) and cost. Commonly used chemicals include trivalent metallic salts of iron, such as FeCI2 or FeSO4 or aluminum, such as AISO4. Organic and inorganic polymers (cationic or anionic) are often used to enhance the DAF process.

The most commonly used inorganic polymers are the polyacrylamides. Chemical flocculant concentrations used normally range from 100 to 500 mg/l. (One mg/l in 1 million gallons per day is 8.34 lbs of material.) The wastewater pH may need to be adjusted between 4.5 and 5.5 for the ferric compounds or between 5.5 and 6.5 for the aluminum compounds using an acid such as H2SO4 or a base such as NaOH. In many applications, the DAF effluent requires pH adjustment utilizing a base such as NaOH to assure the DAF effluent pH is within the limits specified by the POTW (6-9 typically).

Attachment of most of the bubbles to solid particles can be effected through surface energies while others are trapped by the solids or by hydrous oxide flocs as the floc spreads out in the water column. Colloidal solids are normally too small to allow formation of sufficient air-particle bonding. They must first be coagulated by a chemical such as the aluminum or iron compounds mentioned above and then absorbed by the hydrous metal oxide floc generated by these compounds. Frequently, a coagulant aid is required in combination with the flocculant to agglomerate the hydrous oxide flocc, increase particle size and improve the rate of flotation. Mechanical/chemical emulsions can also be broken through pH and polymer reactions.

Where the float is to be used to feed animals used for human consumption, organic compounds such as chitosan, carrageenan, and lignosulfonic acid, or their derivatives can be used. Use only compounds approved by the Food and Drug Administration (FDA) Office of Veterinary Medicine.

Float Dewatering DAF float often contains 2 to l0 percent solids. The solids may need to be dewatered before disposal to reduce the sludge volume by reducing water content. Float dewatering is usually performed by using one of the following technologies:

- Filter press
- Belt filter press
- Centrifuge
- Drying bed
- Vacuum precoat filter