STETFLOAT

Dissolved Air Flotation (DAF) for Oil/Solids Separation

The removal of small particulate matter and oil droplets, for which gravity separation can be extremely slow, requires an alternative process. A method which can be considered in these circumstances is Dissolved Air Flotation (DAF).

Small bubbles of dispersed air released into the effluent, attach themselves to solids or droplets and rise to the surface, taking the contaminants with them.

A typical DAF unit, treating oily waste, where quality of effluent containing less than 5 mg/l is required

APPLICATIONS

Air flotation is a process to be considered where gravimetric separation will not give a sufficiently high quality effluent. This will usually be where there is either some emulsification present or where light solids are in suspension or where solid particles can be removed from a waste solution.

Typical situations:

- Refinery wastes where qualities of effluent containing less than 5 mg/l of oil are required.
- Similar wastes from power stations, rail yards and other diesel based activities.
- Marine ballast/bilge water treatment.
- Industrial waste water treatment.
- Hydroxide wastes from a variety of sources.
- Food industry wastes with a high proportion of vegetable oil and organic matter in suspension.
- Dairy and poultry waste.
- Abbatoir waste.

If necessary, the DAF can be followed by one of our biological plants for further treatment for COD/BOD removal, on which we would be pleased to advise.

PERFORMANCE

Typical figures for oil, suspended solids and COD removal would be:

Oil removal:	80 - 90%
Suspended Solids removal:	65 - 75%
Total COD removal:	60 - 70%

These figures apply to a feed material containing approximately 50 ppm of oil and with influent COD in the range of 1000 to 10,000 ppm and SS in the range of 50 to 400 ppm. At lower feed concentrations, the performance expressed as a recovery rate is usually much lower.

RANGE

1m^3/h to 100m^3/h as standard but larger units available.

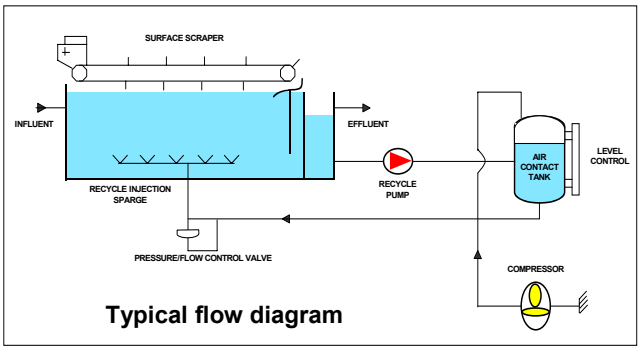
THE FLOTATION PROCESS

The fine bubbles required to assist separation of droplets/ particles can be created by either “induced air” or “dissolved air”. In the case of induced air, known as IAF, recycled flow is pumped through an eductor and air is drawn into the flow, to be released as it enters the bottom of a separating vessel. Bubbles created in this way are rather larger than those created by the second option of dissolved air. IAF plants are generally used where low levels of contamination are present.

In the dissolved air flotation method (known as DAF), compressed air is injected into a pressure vessel containing the recycled fluid at between 4 - 6 bar, sufficient time being allowed in this vessel for saturation to occur. The recycled flow is then released into the base of the separating vessel via a pressure relief valve, allowing the air to come out of solution and creating extremely fine bubbles. Alternative gases, such as N_2 can be used, especially in hazardous/Eexd zones.

In both cases, the released gas forms tiny bubbles which adhere to the suspended matter, causing mechanical separation. However, particularly in the case of the dissolved oxygen, some of the oxygen may react with oxygen-demanding contaminants, thereby achieving a measure of additional reduction in the oxygen demand of the waste.

In practice, the mechanical separation is usually greatly enhanced by the use of coagulating and flocculating chemicals to increase the size of the solid or droplet contaminants. pH correction is incorporated where necessary. We can arrange free bench/jar tests to prove suitability of the DAF process.



Typical flow diagram

Retention times within the plant of 10 to 20 minutes, dependent on the nature of the feed, are required to obtain satisfactory separation and it is therefore usual to precede a dissolved air flotation plant with a free oil separation stage, using one of our Stetpack units, in which retention time is much lower. This has the effect of removing most of the settlable solids prior to the dissolved air flotation plant, making the provision of bottom scrapers unnecessary.

The oil phase in a DAF plant usually comes to the surface in the form of an aerated scum. This requires scraping from the surface by a chain driven mechanical scraper. The ratio of recycled flow to throughput is important and must be selected to provide good distribution of the bubbles across the tanks.

Typical surface scum from food processing effluent

Stetfield Separators plants include:

- separation/flotation tank
- surface contaminant removal scrapers and collection trough
- dissolved air contact tank with visual level indication
- flow controls
- chemical mixing tanks or ‘serpentine’ pipe
- air compressor

The smaller plants are supplied mounted on a pre-built skid completed with an electrical control panel. Larger plants are based on a rectangular tank and either pre-built or site-built.

Larger plants for flows up to several hundreds of cubic metres per hour are purpose designed.

Because of the variable nature of the feedstock, it is nearly always necessary to undertake field pilot trials to establish performance of a dissolved air flotation plant. We will be pleased to discuss this with you.

stetfield separators

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