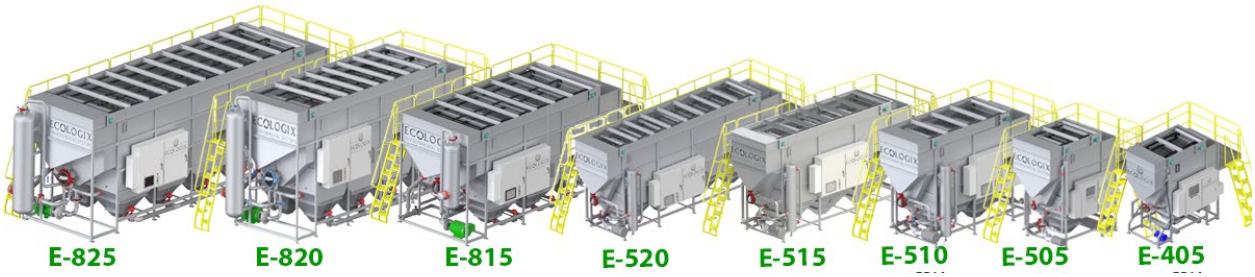
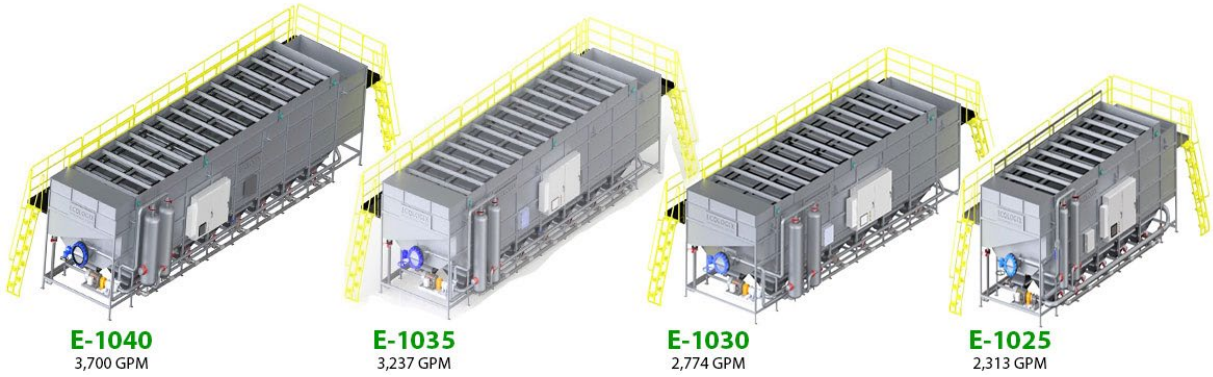
Ecologix Environmental System's

Enhanced Dissolved Air Flotation (E-DAF)





ECOLOGIX™
ENVIRONMENTAL SYSTEMS

11800 Wills Rd, Ste 110, Alpharetta, GA 30009 | 678.514.2100
www.EcologixSystems.com

Table of Contents

INTRODUCTION

Background

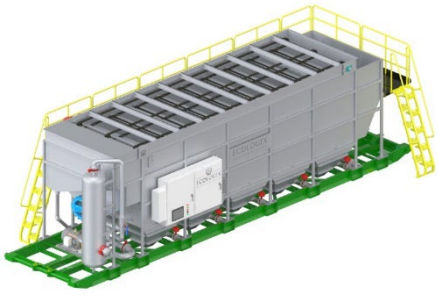
Dissolved air flotation (DAF) is a proven method of a primary (physical/chemical) wastewater treatment to remove Suspended Solids (TSS) and Fat, Oil and Grease (FOG) from dirty industrial and municipal wastewater.

The process starts by injecting certain chemicals into the wastewater, followed by introducing air to a side stream or recycle stream at elevated pressures to create a supersaturated "whitewater" stream with millions of tiny air bubbles. These bubbles attach themselves to contaminants in the waste, lifting them to the surface of the water as sludge.

The most important operational parameters for contaminant removal by Dissolved Air Flotation are:

- air pressure
- recycle flow rate
- influent total suspended solids (TSS) including fat, oil and grease (FOG)
- bubble size
- dispersion

The A/S (Air to Sludge) ratio is most important in determining effluent TSS. Recycle flow and pressure can be varied to maintain an optimal A/S ratio. Typical DAF values are 0.02-0.06 (the higher the better). The E-DAF ratio values, by contrast, vary from 0.06 to 0.09 ml/mg, resulting in a much cleaner effluent than a typical DAF system. It is fairly common to obtain zero NTU (turbidity) with the E-DAF, making the effluent water appear as clear as tap water.



E-DAF vs. regular DAF – What is the difference?

Unlike a regular DAF, an E-DAF (Enhanced DAF) is fully automated and improved in every aspect. It manifests itself in three major ways:

1. Better quality effluent water
2. Lower operating cost
3. Lower maintenance cost

PROCESS OPERATIONS

1. **Chemical Conditioning**: Raw wastewater is first moved into an Equalization Tank, where pH Adjustment is performed. It is then moved through either Floc Tubes (FLT) or Chemical Reaction Tanks (CRT), where coagulants such as alum, poly-aluminum chloride (PAC) or Ferric Chloride are fed into the wastewater to neutralize charges on the colloidal particles. Polymer are also added to agglomerate and aid in the creation of large floc, to which the air bubbles will attach themselves.

2. **Chemically Treated Water E-DAF Inlet:** Chemically treated wastewater now enters the E-DAF vessel and is met with a recycled flow of supersaturated "white water". This recycled stream is produced by recycling 20%-30% of the clarified water. This clarified water is taken through a pressurization step, followed by a separation step in a special Saturation Tank, resulting the finest and smallest air bubbles possible measuring 1µm to 20µm in size. The small air bubbles will attach to the floc and together enter into first separation chamber, where all the sludge will now be lifted to the surface of the water.

3. **Whitewater Pump:** Unlike most other DAF suppliers, the E-DAF does not require a proprietary pump to generate 'Whitewater'. Any off-the-shelf standard ANSI pump or closed-couples pump can be used. This saves cost, reduces lead time and makes maintenance much easier.

4. **Saturation Tank:** In addition to the 'whitewater' pump, the E-DAF has a secondary refinement stage in the form of one or two saturation tanks. There, the large air bubbles are separated away, and only the smallest bubbles, 1µm to 20µm in size, are used to form a milky looking water that, when mixed with the influent wastewater, creates the perfect separation of Suspended Solids and Fat, Oil, and Grease from the wastewater.

5. **Flotation Zone:** At the surface of the water the sludge meets with a thickener grid, which prevents it from migrating toward the effluent outlet and helps thicken the sludge layer, resulting in dryer sludge. Simultaneously, the top-mounted scraper system moves in a counter-current-flow direction and removes the floating sludge into a separate sludge holding compartment.

6. **Inclined Tubes:** Throughout the length and width of the E-DAF are seated 60 degrees inclined tubes to provide more surface area and a rapid separation of solids.

7. **Scouring Nozzles:** Below the Inclines Tubes is an array of compressed air nozzles that are turned on from time to time to flush out any sticky sludge build-up in the interior of the inclined tubes.

8. **Sludge Holding Compartment:** The floating sludge is removed into the sludge holding compartment, where it is pumped with a tri-lobe sludge pump into an external sludge holding tank for further dewatering treatment.

9. **Cone Bottom Sludge Hoppers:** To capture heavy solids, such as sand, 1 to 16 hoppers (subject to the size of the E-DAF) are positioned at the bottom of the vessel. There are no moving parts or augers, nothing to break down. Each hopper can be purged automatically of any accumulated solids by simply opening and closing a valve for a few seconds every few hours or days, per operator's wish. These heavier solids are pumped into the same outside sludge holding tank for further dewatering treatment.

10. **Clear Well:** To minimize the possibility of effluent contamination, the clear well is positioned on the opposite side of the E-DAF from the sludge holding compartment. The clear well also includes a weir adjustment mechanism that maintains the overall water level throughout the E-DAF.

11. **PLC Controls:** The brain of the entire E- DAF is powered by either an Allen Bradley, Siemens PLC, or similar. It is here that we control all the instrumentation, chemical feed pumps, whitewater pump, valves, scraper, sludge pump, and influent and effluent pumps. Full automation is attained here.

12. **Pneumatic Controls:** All air related requirements, such as flow rate and pressure are controlled by this proprietary Ecologix system. Furthermore, the normally, non-linear analog nature of air is converted into a digital signal that is linked into the main PLC to be centrally controlled & monitored.

13. **Remote Monitoring and Control:** The E-DAF includes an optional capability for remote monitoring its local operations. This may include monitoring of video, instrumentation, chemical dosing, etc., to aid field operators. This can help ensure smooth and trouble-free operations. Also helps in cost estimation and usage.

14. **Staircase and Mezzanine:** The most ergonomic staircase is included with the E-DAF, enabling the operator to step up and down facing forward even when carrying tools. The OSHA approved mezzanine itself is engineered to ensure non-slip functionality with bright yellow handrails for safety.

Bakery Wastewater – Georgia, USA

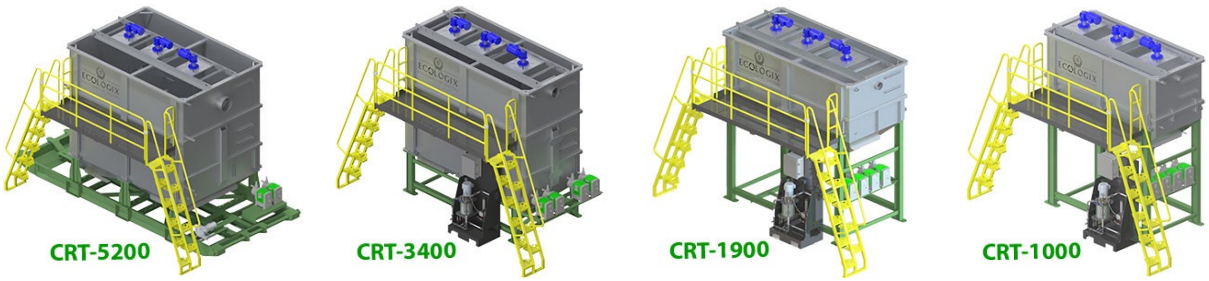
Whitewater – Sludge – Clear Water

Graphics and Pictures

1. Flocculation Tubes (FLT)
2. Chemical Reaction Tanks (CRT)
3. Programmable Logic Control (PLC)
4. Pneumatic Control (Air Control)
5. Pictures of real field installations

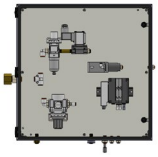
1. Flocculation Tubes (FLT)

2. Chemical Reaction Tanks (CRT)



3. **Programmable Logic Control (PLC)**

4. **Pneumatic Control (Air Control)**



5. **Frac Water Treatment in West Texas.**