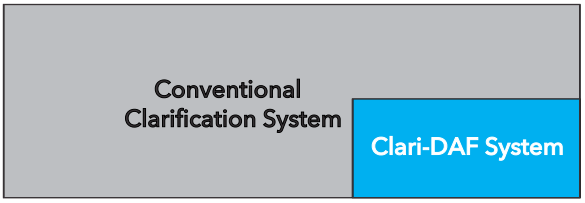
Features and Benefits

High Loading Rates

The Clari-DAF system can accommodate loading rates of up to 20 gpm/sf (48.4 m/hr). This not only contributes to its compact design, but also means that flow-through can be increased by as much as 16 to 40 times that of conventional clarification tanks.

Compact Design

Because of its high loading rate, the area needed for a Leopold Clari-DAF system is one-sixth to one-twentieth of that required for conventional clarification. The small footprint of the Clari-DAF system improves land use, especially in existing plants with no room for expansion. Its compact design also means that it can be retrofit in existing conventional clarification tanks.



Effective Operation in Low-Temperature Raw Water

The Clari-DAF system process is unaffected by low-temperature raw water. At an 8% recycle flow and 70 psi saturation pressure, the Clari-DAF system creates over 600 million approximately 40-micron bubbles per gallon at 40°F (4.4°C). The presence of large numbers of bubbles increases the chance of bubbles attaching themselves to suspended floc. With conventional clarification, increased chemical addition and mixing – at increased expense – is necessary to achieve larger, heavier floc that will settle in dense, low-temperature raw water.

Longer Filter Runs

Because the Clari-DAF system removes more solids than conventional clarification, filters can run longer between backwash cycles. Fewer backwash cycles means less backwash water, less media breakdown, less filter-to-waste on filter start-up, and lower energy cost.

High Sludge Concentration

Solids content of the floating sludge at the time of discharge is 3% to 5%, compared to 0.5% to 1.0% for conventional clarification. This results in increasing the efficiency of sludge handling equipment and a reduction in the cost for sludge processing. Dewatering can occur without additional thickening, eliminating expensive sludge thickeners. There is less volume of sludge to handle, less chemical conditioning, less time to dewater and lower energy costs. And because cake solids are higher, disposal costs are reduced.

Rapid Start-Up

Good-quality effluent can be achieved within 45 minutes of start-up. Other high-rate processes can take several days to form a stable floc blanket during start-up. Rapid start-up is ideal where daily flow variations occur and continuous operation of full plant capacity is not needed. Rapid start-up plants are ideal, too, for automatic start-up and shut-down without an operator– and associated labor costs.

Steel or Concrete Tank Installation

The Leopold Clari-DAF system can be constructed above-ground using a steel tank when the design flow rates are low (<1 MGD/ 3,785 m per day) or in-ground using a concrete tank for larger units. This flexibility contributes to keeping capital costs low.

The Clari-DAF System Is Applicable for a Variety of Source Waters

The Leopold Clari-DAF system process is versatile enough to be used for potable water or wastewater clarification applications. For filter backwash water treatment, the Clari-DAF system typically can remove Giardia cysts and Cryptosporidium oocysts by >3.0 log each. This is significantly better than conventional clarification and exceeds U.S. Environmental Protection Agency (EPA) "toolbox" standards.

The Leopold Clari-DAF System Can Lower Your Total Cost of Operation with Improved Water Quality

- Longer filter runs
- Less backwash water
- Less media breakdown
- Lower energy cost
- Less filter-to-waste
- Reduces or eliminates filter aids

The Leopold Clari-DAF System Can Lower Your Total Cost of Operation with Improved Solids Handling

- Less volume of sludge to handle
- Less time to dewater
- Lower energy cost
- Lower chemical cost
- Higher cake solids
- Lower disposal costs

The Clari-DAF system creates a milky solution of hundreds of millions of microbubbles 20 to 100 microns in size that rapidly float suspended particles to the surface for removal.

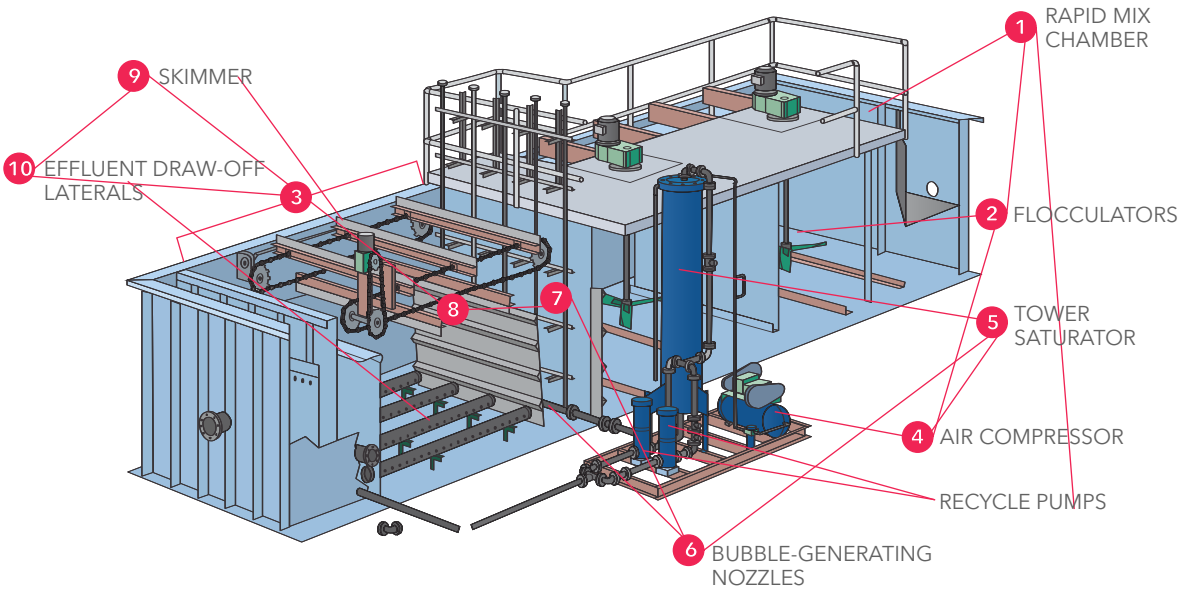
The floating sludge blanket–a mass of solids formed by the microbubbles that have captured and floated the pin floc to the surface–is easily removed with a mechanical skimmer or by hydraulic overflow.

The next step for this sludge produced by a Clari-DAF system is dewatering equipment.

Shortly after start-up, the Leopold Clari-DAF system can produce crystal clear water.

Clari·DAF™

How the Leopold Clari-DAF System Works



1. The Clari-DAF process starts with raw water being dosed with an aluminum or iron-based inorganic coagulant in a rapid mix chamber, much like that of conventional sedimentation. Lower doses than sedimentation are used because a pin floc is desired instead of a sweep floc.

2. Good coagulation is the most important factor affecting flotation. Two-stage tapered flocculation is standard. G values of 30 to 70 are typical for full-scale operations. Low tip speeds prevent the fragile floc from being sheared. Flocculation time is only one-fifth of that needed for conventional clarification.

3. Hydraulic loading rates based on collector area range from 8 to 15 gpm/sf (19.36 to 38.72 m/hr), although pilot testing has shown that rates up to 20 gpm/sf (48.4 m/hr) are not unusual. As a result, the Clari-DAF system requires a smaller footprint than conventional sedimentation.

4. After a pin floc is formed, the raw water stream is injected with water that has been saturated with air at 60 to 90 psi. The saturation process is accomplished by taking a fraction of the throughput, typically 10% of design flow, and recycling it back to a pressure vessel. VFDs control the recycle pumps to maintain a balance in the saturator. A compressor provides a constant pressure of oil-free air to the saturator.

5. The saturator, a packed tower for water or unpacked-tower for wastewater, mixes the water and air.

6. The aerated water is delivered to a distribution header that spans the width of the Clari-DAF cell. This distribution header has a series of specially designed orifices or nozzles. As the pressurized water exits the nozzles, the pressure drop produces a cloud of hundreds of millions of microbubbles that are approximately 40 microns in size.

7. The contact zone is given a milky appearance like that of a whitewater blanket. The tiny air bubbles rise through the coagulated water, capturing floc as they ascend to the surface. The tiny spherical bubbles rise under laminar flow at a rate following a modified Stokes Equation.

8. A blanket of sludge forms on the surface of the Clari-DAF cell. The blanket is supported from beneath by the microbubbles.

9. The sludge blanket that forms on the top of the Clari-DAF cell is removed periodically by either a mechanical scraper or by hydraulic means. Under certain conditions removal can be achieved using a combination of both mechanical and hydraulic processes.

10. The clarified effluent water is drawn off the bottom of the tank by a series of lateral draw-off pipes that allow for uniform distribution along the bottom of the Clari-DAF cell.

Combine Cutting-Edge Filtration with High-Rate Clarification

(Integral Media Support) cap, and Leopold® Engineered Filter Media® anthracite all work together to optimize your treatment plant's operation with one goal in mind: to produce the highest quality water at the lowest cost. The loading rate is limited by the loading rate allowed by the local regulatory agencies.