

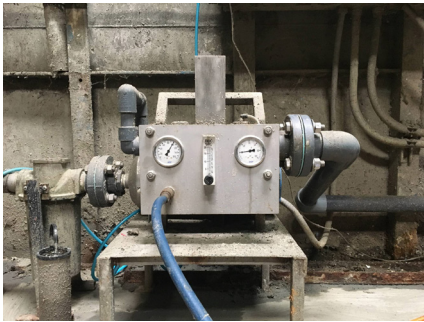
MOLEAER™ GOES BEYOND TYPICAL AERATION FOR DISSOLVED AIR FLOTATION SYSTEMS

Robust XTB™ delivers energy savings and worry-free operation, able to handle large particles in sludge waste management

Most modern dissolved air flotation systems require that a certain portion of clarified water be recirculated back through a bubble generator or pressurized water tank saturated with air. Moleaer's XTB Nanobubble Generator is unique from all other aeration devices because of its ability to consistently generate bubbles of proper size with no coarse air bubbles. Once introduced into a DAF clarifier tank, Moleaer's nanobubbles rise to the surface at the rate of approximately 8-12 inches per minute, creating a thick coat on the water's surface.

The Moleaer XTB Generator was recently installed (see Picture 1) at a plastics recycling plant in Chino, California, specialized in post-consumer recycled polyolefin resins (HDPE). The company had previously employed a conventional flotation system that recirculated the water through a pressurized tank into which gas was then dissolved prior to re-entering the DAF (see Figure 1).

Client:	Plastics Recycler Chino, California (USA)
Type:	Dissolved Air Flotation (DAF)
DAF Size:	10,000 gallons
Unit Type:	Moleaer 50 XTB
Installed:	November 2016



Picture 1: Moleaer XTB Nanobubble Generator installed at Chino plastics recycling plant.

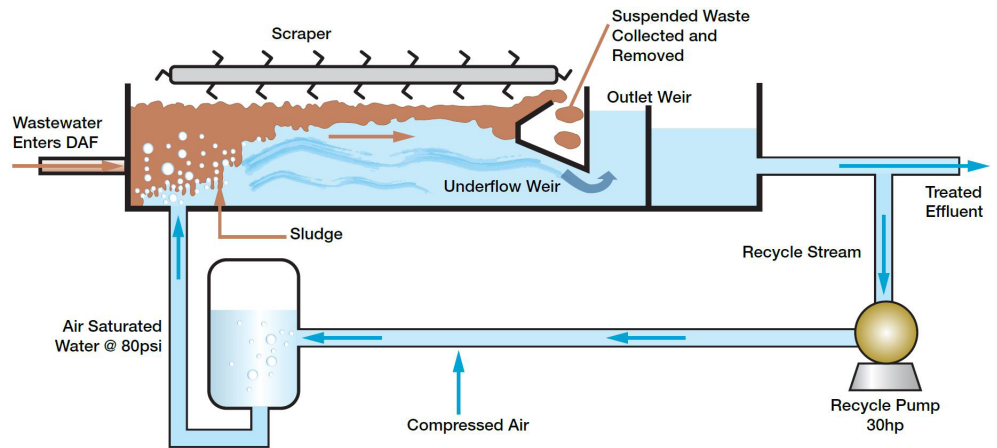


Figure 1: Conventional Dissolved Air Flotation (DAF) system



Picture 2: New impeller (right). Impeller after three months of use (left). Worn caused by residual plastic chips is clearly visible on the old impeller

Because the tank's pressure certification expired in 2014, they purchased a 15 HP white-water pump to provide the necessary air and replace the legacy system. After three months of operation, residual plastic chips that remained in the DAF's recirculation loop wore down the white-water pump's titanium impeller, making it inoperable (see Picture 2, left). However, rather than replacing the damaged impeller (an estimated \$13,000 investment), they sought a more robust and effective solution to improve their flotation system – the Moleaer XTB Nanobubble Generator.

The Moleaer XTB Nanobubble Generator was an easy and worry-free alternative for the plant operators as it utilized a low-cost recirculating centrifugal pump and demonstrated its ability to handle particles, up to 12mm in size, which flow through the unit at low pressure. The required horsepower (HP) for this pump is only 2 HP versus the 15 HP previously used by the white-water pump. In addition, when compared to conventional DAF systems, the Moleaer XTB installation (see Figure 2) eliminated the need for the higher HP recirculating pump and pressurized tank, delivering significant savings in energy.

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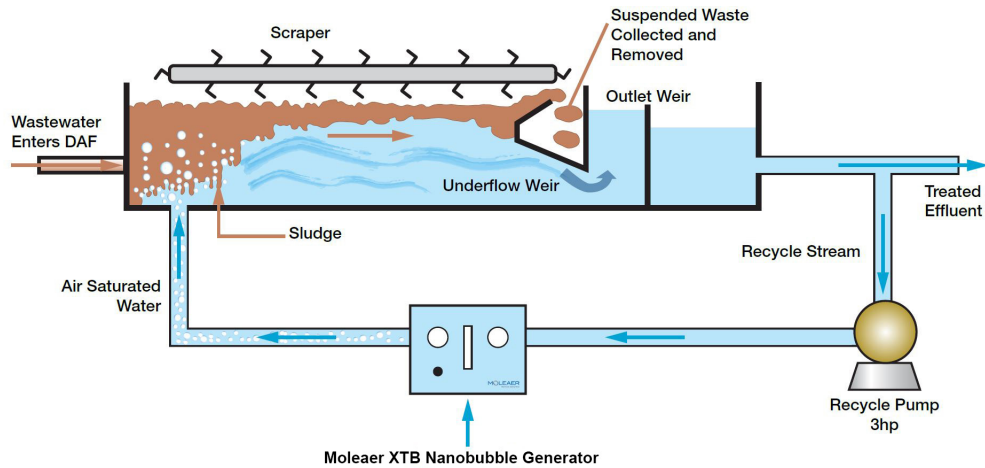


Figure 2: Moleaer XTB Nanobubble Generator installed in-line, utilizing a much lower HP-rated recirculating pump and eliminating the need for the pressurized tank.

The Moleaer™ XTB™ aeration system is a proven, cost-effective solution for DAF systems. Table 1 below illustrates the operating costs before and after installation of the Moleaer XTB Nanobubble Generator.

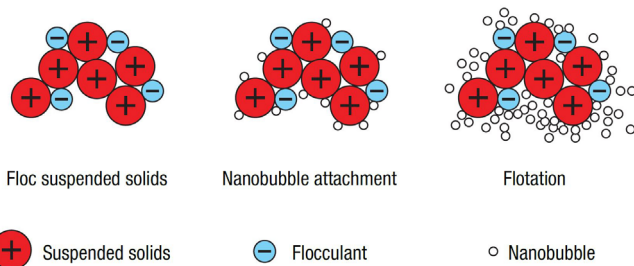
DAF Aeration System	White-water Pump	Moleaer 50 XTB
Specifications	<ul style="list-style-type: none"> 75 GPM at 60-80 psi 15 HP 	<ul style="list-style-type: none"> 50 GPM at 15 psi 2 HP
Estimated energy cost per year	\$9,829 USD	\$1,310 USD
Maintenance & repair cost	\$13,000 USD (after 3 months)	\$1,200 USD per year*

* Assumes annual maintenance cost for the centrifugal recirculating pump

Moleaer has clearly demonstrated that its XTB Nanobubble Generator can tolerate large particle sizes and loading unlike other white-water pumps available on the market today.

Moleaer’s nanobubbles possess unique properties that make them well suited for DAFs. All particles, including nanobubbles, have a “surface charge” when present in water. Just like the “surface area”, it is a fundamental parameter that directly impacts the performance characteristics of any suspension. Surface charge effects are negligible for massive solids, however they are superior when interacting with colloidal particles (see Figure 3).

Nano-sized air bubbles in water are negatively charged. The high concentration of negatively-charged paramagnetic nanobubbles created by the Moleaer Nanobubble Generator has two effects on particles suspended in water: (1) it alters the ionic equilibria of any dissolved ionic species in a solution and (2) it changes the net charge on a particle surface. Both factors positively influence the stability of the particle suspension. The substantial increase in the surface area between air and water provides a much greater contact area for better chemical mixing. It impacts the efficiency of chemical reactions with any dissolved or suspended components in the water and enhances aerobic bacterial activity.



Moleaer’s nanobubble generators can be installed quickly with minimal retrofitting, meaning there is no disruption to daily operations. They have a proven track record of reliability, are rated for 10+ years of continuous operations, and require minimal maintenance. The units are self-cleaning and do not foul or plug.