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Wignity
Water Dignified

Wignity, adj. - to add
dignity to the world of
water management

Dear Water Warriors,

Success of an ETP Recycle project often depends upon Pretreatment before Aeration. Here removal of Oil, Grease, Fat and Fibers can significantly lower the energy requirement in COD Removal.

Further Nanobubbles have redefined the reaction rates and efficiency in various reactions.

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Fibers, Biodegradable fibers or NOMs such as Starch, Peels, Pulp of fruits and vegetables, Oil & Graese, FAT, Animal Fat, Meat & Fish Processing by products, Micro plastics.

If these are the impurities expected in your waste (defined as pCOD), one thing you can never do and should not do:

Coagulation !!

So, please also rule out and removal based on “Settling” and Clarification. I won’t help

If our focus is Primary Treatment before Aeration the key products to use in such situations are :

1. API
2. TPI/CPI
3. Dissolved Air Floatation

Let’s understand them further.

What we need to design?

Flow Rate of effluent to be treated?

Source of the effluent

Inlet Parameters:

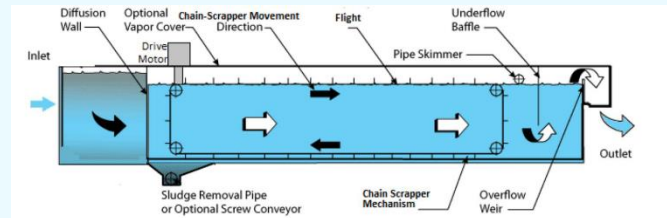
1. Oil present in the effluent (mg/l)
2. If there is oil, is it free or emulsified oil? Ratio.
3. Specific gravity of the free oil
4. Total suspended solids (mg/l)
5. VSS/TSS Ratio
6. BOD (mg/l)
7. COD (mg/l)
8. FOG – fats, oils, grease (mg/l)
9. pH (define Free Acidity if pH < 4.0)
10. Temperature
11. Operation continuing or intermittent

Outlet Parameters:

1. Total Suspended Solids (mg/l)
2. BOD (mg/l)
3. COD (mg/l)
4. FOG (mg/l)

API TPI & CPI Separators:

This unit was first used in Oil Industry and early guidelines were issues by American Petrochemical Institute and hence the name API separator.



APIs are designed to efficiently remove free-floating oil from water by employing a combination of gravity separation and coalescence.

With time, designers modified the designs as :

The Tilted Plate Interceptor TPI that operates based on the principles of gravity settling and coalescence, leveraging inclined plates within a compact unit. These plates are positioned at an angle, usually between 45 to 60 degrees, allowing for the formation of a larger surface area where oil droplets and solid particles can interact and separate from the water.



The Corrugated Plate Interceptor (CPI) performs the same function however, instead of plates, there is a corrugated plate pack inside of the main tank. TPI/CPI units can be manufactured in a completely metallic tank, with protective coatings, or in a civil tank with wetted metallic parts.

PureBubble™

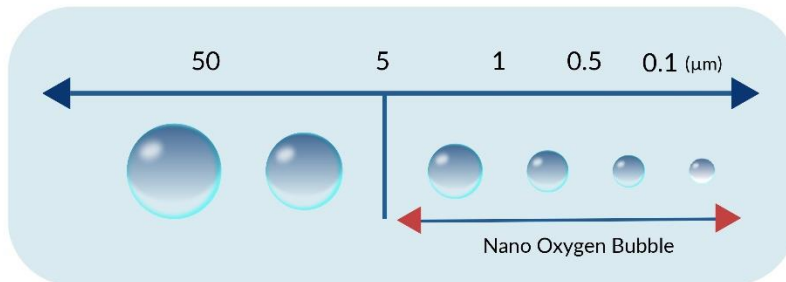


EMBRACE THE POWER OF NANOBUBBLES

What are Nanobubbles?

Nanobubbles are a unique class of science that produce extraordinary improvements in water treatment, F&B and resource recovery. Pure Water's patented technology - PureBubble - injects trillions of nano-sized gas bubbles into liquid and deliver best-in-class gas-to-liquid transfer.

The key operating principal behind this significantly higher gas dissolution in water is the ability of nanobubbles to stay under the surface of water for a very long time without bursting, consequently increasing contact time.



- Bubble of less than diameter 1µm is called a **Nanobubble (NB)**.
- 50µm diameter of Bubble and less is called a **Microbubble (MB)**.

FEW OF THE MANY APPLICATIONS:

- **DRINKING WATER** - Higher ozone dissolution and superior disinfection
- **WATER/WASTEWATER** - Efficient aeration and significant COD/BOD reduction
- **AQUACULTURE** - Increased Dissolved Oxygen
- **HORTICULTURE** - Superior water quality for higher yield and longer shelf-life
- **PONDS & LAKES** - Effective bioremediation through a chemical-free solution
- **POULTRY/LIVESTOCK** - Improved water quality, higher yield and disease prevention



PureBubble - Nanobubble Generator At Work

Dissolved Air Flotation System:

The equipments before DAF clarifiers do roughing. They can remove Free Oil, a little bit Emulsified and also little bit of TSS.

DAF as the name suggests uses Micro bubbles of Air to attach the particulates and makes the Flock float up. An additional plus point is heavy particles (Suspended) can settle in same unit on the principle of physio-chemical process of solid-liquid separation.

Thus, DAFs are used to reduce or remove Total suspended solids, emulsified oil, fats, algae and grease from the effluent.

In many cases they are also used to remove BOD and COD associated with the suspended load. This is done with the help of and micro bubbles which are generated in the Air Dissolving Tube (ADT) and chemical dosing.

These bubbles are released into the main DAF tank where it attaches itself with lighter flocs and floats to the surface where it is removed with the help of a scoop or scrapper.

The effluent is required to be dosed with chemicals and flocculants before entering the DAF tank in order to get the solid particles to enhance the solid-liquid separation and create flocs.

The heavier solid particles settle to the bottom of the tank and are periodically removed with the help of sludge bleed valve under hydrostatic pressure or a sludge Pump.

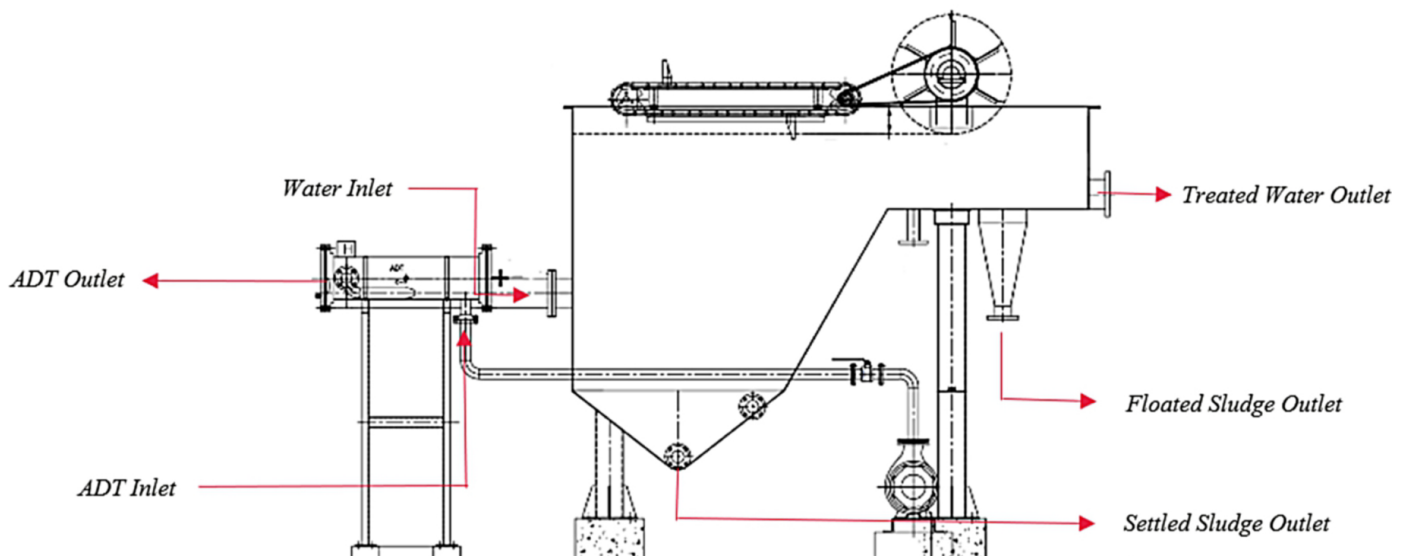
While **Blue Points marked** are key data required for designer to suggest which model and size would be the optimal for the application, we do suggest certain inputs for the best efficiency and economic feasibility such as:

opting for civil tank rather than metallic for very large flows to save on cost, or for using a certain grade of stainless steel over mild steel if parameters of water have high tendency to rust the material.

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Gas Reactions – Role of Nano Bubble Generator

Oxidations – either by Cl_2 , NaOCl or ozone or in the same way in aeration tank using Air rely on “Contact”, higher the contact less is the wastage and thereby higher efficiency and lower chemical or energy consumption.

A nanobubble generator is a device designed to produce extremely small bubbles, typically ranging from tens to hundreds of nanometers in size, in a liquid medium. The working principle of a nanobubble generator involves several key steps:

Gas Dissolution: The process begins with the dissolution of a gas, such as oxygen or ozone, into a liquid medium. This can be achieved through various methods, including direct injection, diffusion, or electrolysis.

Bubble Formation: Once the gas is dissolved in the liquid, the nanobubble generator creates conditions that promote the formation of bubbles. This often involves inducing nucleation sites within the liquid, where gas molecules can accumulate and coalesce to form bubbles.

Bubble Size Control: Unlike conventional bubble generators that produce larger bubbles, nanobubble generators are designed to generate bubbles on a much smaller scale. This is typically achieved through precise control of operating parameters such as gas flow rate, pressure, and agitation intensity.

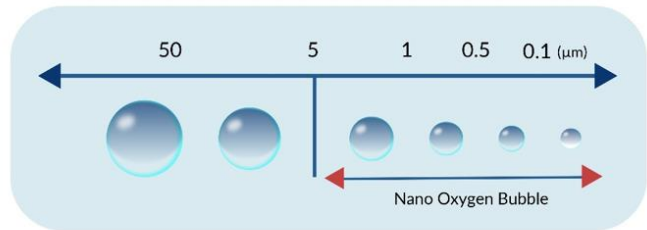


Image Nano Bubble Generator

Nano Bubbles (NBs) are defined by the International Standard Organization (ISO) as gas-filled cavities with a volume equivalent diameter of less than $1\ \mu\text{m}$ (ISO, 2017). Macrobubbles (MaBs) and microbubbles (MBs), which are larger than NBs as their names suggest, have been widely applied in water treatment processes, including flotation (DAF) aeration (MBR & MBBRs) and membrane Scouring

These coarser bubbles disappear quickly in water, either rising up and collapsing at the surface or shrinking and dissolving in water, which limit their overall efficiency. NBs, on the other hand, are highly stable and can exist in water from a few hours to up to several months.

Besides their high stability, NBs possess other distinctive properties, such as a high surface area-to-volume ratio, high negative zeta potential, low buoyancy, and the ability to generate radicals, which allow them to contribute to physical, chemical and biological water treatment processes in many ways.



Nano Bubbles in combination with H_2O_2 and O_3 could be the future choice for treatment of high strength wastewater that are toxic in nature

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STRONGER
Together

Strength in Unity

Collaborative Excellence in Water Treatment



Join us in embracing the "Stronger Together"
This initiative aims to unite us all in our efforts, emphasizing collaboration, support, and synergy within our community.

Let's join hands and make a difference together!

