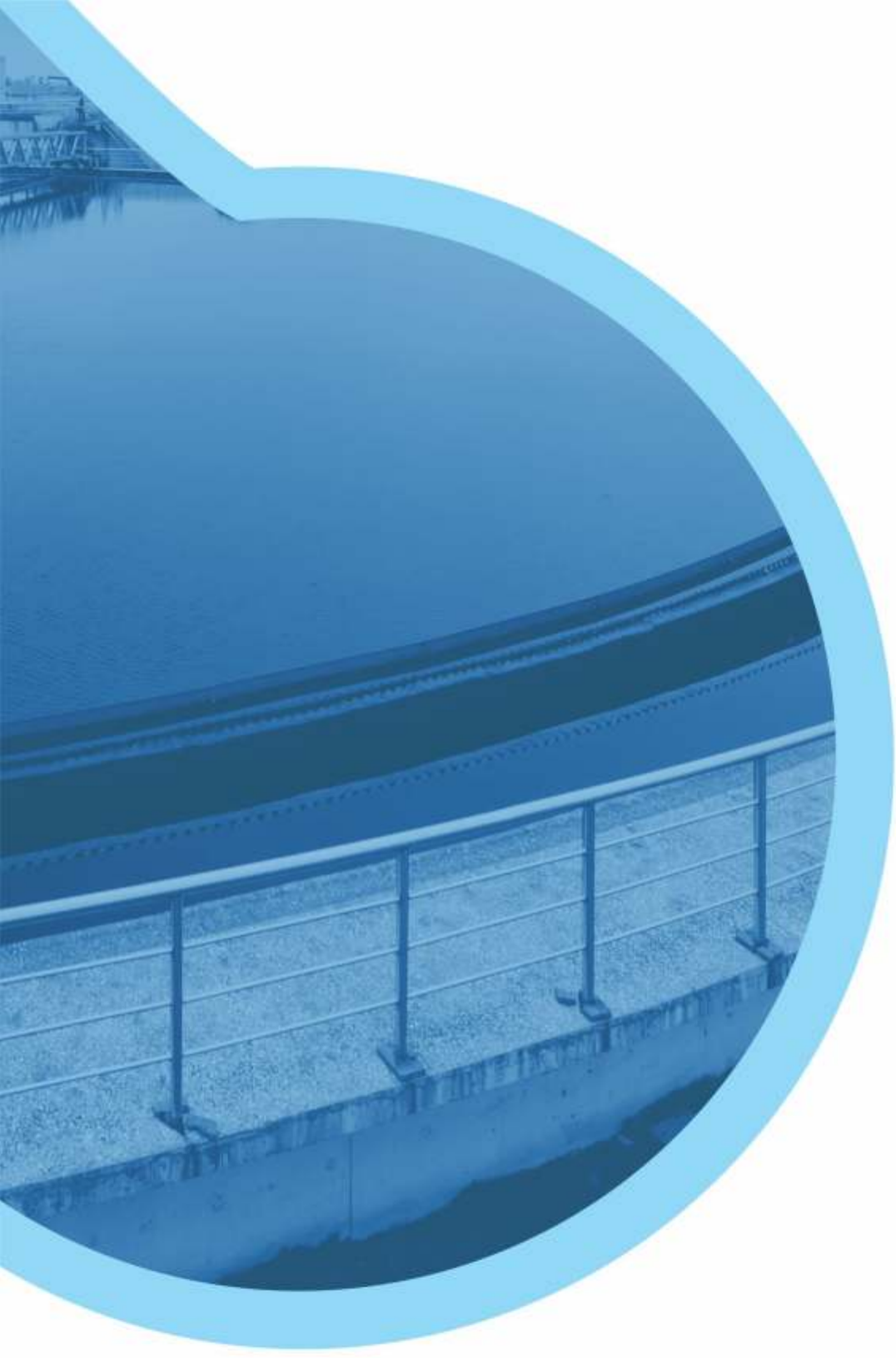


OCEANIDES
GLOBAL SOLUTIONS

"Oceanides Global Solutions"

A Total Water Management Company provides End to End Solutions in the field of Water & Environment management to global customers, consultants and OEMs.

Oceanides is a technology driven Company managed and operated by technocrats having more than 20 years of valuable experience. The company provides cutting edge engineering services and total solutions.

Oceanides offers advanced solutions for all Medium & Large Scale Water & Waste Water Treatment projects.

We execute small, medium and large projects for water, waste water and environment management in Industrial, Municipal and Infrastructure segments. We undertake Water & Waste Water Management Projects on Turnkey basis (CONCEPT TO COMMISSIONING) with timely completion is ensured.





Nurturing the Nature

*Manufacturing unit in Rajkot



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Director's Statement



Siddharth Shah



Jayraj Shah

"Establishment in the year 2009, we, at Oceanides Global Solutions, are betrothed in designing, manufacturing, supplying, erecting and commissioning a qualitative range of water, waste water & sewage treatment plant including zero liquid discharge (ZLD) in RAJKOT, Gujarat, which are made available and implemented based on the customer's need. Our activities also include providing operation maintenance, Pollution Control Boards (PCBs) job work and consultancy services to the clients regarding their regulatory & statutory requirements. The solutions devised by us are designed keeping the clients specific needs in mind and all these solutions are tailor made, easy in operation and technically and economically viable and can be customized to suit their demands. We use only high class grade of all raw materials for fabricated tanks that might be FRP/MS or SS while executing the treatment plants .The company engineers have direct access to all resources required to execute and implement the most effective turnkey, customization and after-sales services.

We are fully supported by in house infrastructure facilities which include a manufacturing / production unit, designing facility including GA/HFD/P&ID/Detailed engineering packages, testing laboratory and research development wing. We at Oceanides Global Solutions believe in suggesting the technology after vigorous study on the nature of effluent or waste water before it takes project shape .These divisions are manned by experienced personnel, and have access to the latest and advanced technologies. The range offered by us is developed in accordance to the norms laid down for this industry, and the services rendered by us comply with all national International standards. Our exhaustive product service range is serving abundant requirements in Textiles, Processing units, Food and Beverages, Brewers and Distilleries, Pulp & Paper, Pharmaceuticals, Chemicals & Intermediates, Dyes & Intermediates, Dairy & Dairy products, Hospitals. Real Estates, Malls, Leather & Tannin, Steel as well as Automobiles industries.

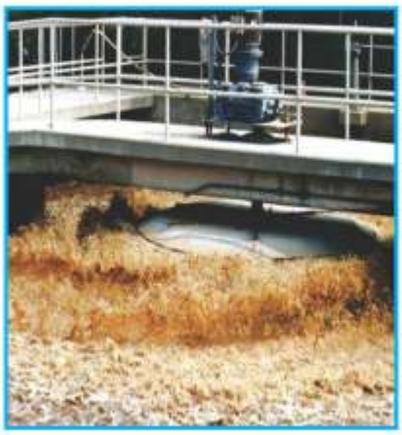
We take gratification in introducing ourselves as a complete civil contractor, pipe manufacturers & piping network contractor and designer, supplier of all range of Water and waste water treatment plants like flash mixers, dosing tanks and systems, pressure sand filters (PSF), activated carbon filters (ACF), Micron cartridge filters (MCF), Ultra filtration (UF), Reverse Osmosis (RO), Nano filtration (NF), clarifier mechanisms, DM plants, Softening plants , Iron Removal Filter as well as scrubbers for air pollution control, Evaporators for ZLD system and allied works as turnkey projects. We also undertake desalination projects (Sea Water Treatment) on DBOT/BOOT/PPP models with our Dubai based technology & business partner."



• Oceanides Activated Sludge Process (OASP)

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Oceanides Activated Sludge Process (OASP)



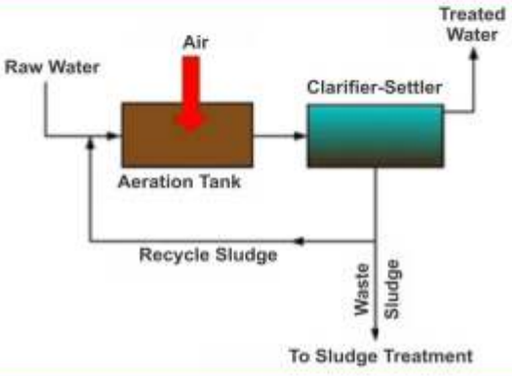
Activated Sludge Process

This process is purely based on the active biomass and their metabolic process degrading organic matters like COD & BOD and leverage CO2 & H2O as end product. The process is conventional and quite acceptable if large area or foot print is available.

The Activated Sludge (AS) is a Process dealing with the treatment of sewage and industrial waste waters and developed around1912-1914. There is a large variety of design, however, in principle all AS consist of three main components: an aeration tank, which serves as bio reactor; a settling tank ("final clarifier") for separation of AS solids and treated waste water; a return activated sludge (RAS) equipment to transfer settled AS from the clarifier to the influent of the aeration tank (Fig. 1). Atmospheric air or in rare cases pure oxygen is introduced to a mixture of primary treated or screened sewage (or industrial wastewater) combined with organisms to develop a biological floc ("Activated Sludge" AS).

The mixture of raw sewage (or industrial wastewater) and biological mass is commonly known as Mixed Liquor. The typically, dry solids concentrations of mixed liquor (MLSS) range from 3 to 6 g/L. With all activated sludge plants, the concentration of biodegradable components present in the influent is reduced due to biological (and sometimes chemical) processes in the aeration tank. The removal efficiency is controlled by different boundary conditions, e.g. the hydraulic residence time (HRT) in the aeration tank, which is defined by aeration tank volume divided by the flow rate. Other factors are: Influent load (BOD5, COD, Nitrogen,...) in relation to the AS solids present in the aeration tank (Food: Microorganism Ratio, F:M Ratio), oxygen supply, temperature, etc. At the effluent of the aeration tank, mixed liquor is discharged into settling tanks and the supernatant (treated waste water) is run off to be discharged to a natural water or undergo further treatment before discharge. The settled AS is returned to the head of the aeration tank (RAS) to re-seed the new sewage (or industrial wastewater) entering the tank and to ensure the desired MLSS concentration in the aeration tank. Due to biological growth (and solids present in the raw waste water which are only partly degraded), excess sludge eventually accumulates beyond the desired MLSS concentration in the aeration tank. This amount of solid (called Waste Activated Sludge WAS) is removed from the treatment process to keep the ratio of biomass to food supplied (sewage or wastewater) in balance and the F:M ratio in a defined range. WAS is stored away from the main treatment process in storage tanks and is further treated by digestion, either under anaerobic or aerobic conditions prior to disposal.

The Diagram of Activated Sludge Process



Many sewage treatment plants use axial flow pumps to transfer nitrified mixed liquor from the aeration zone to the anoxic zone for de-nitrification. These pumps are often referred to as Internal Mixed Liquor Recycle pumps (IMLR pumps). The raw sewage, the RAS, and the nitrified mixed liquor are mixed by submersible mixers in the anoxic zones in order to achieve de-nitrification.

Purpose

In a sewage (or industrial wastewater) treatment plant, the activated sludge process can be **used for One or several of the following purposes:**

- Oxidizing carbonaceous matter: biological matter.
- Oxidizing nitrogenous matter: mainly ammonium and nitrogen in biological materials.
- Removing phosphate.
- Driving off entrained gases carbon dioxide, ammonia, nitrogen, etc.
- Generating a biological floc that is easy to settle.
- Generating a liquor low in dissolved or suspended material

However, "OXIDATION DITCH (OD)" &" EXTENDED ACTIVATED / AERATION SULDGE PROCESS (EASP)" are the types of ASP only but can be promoted depending on the types and nature of pollutants / effluents requiring larger retention time for degradation.



• Oceanides Global Sequential Batch Reactor Technology (OSBR)

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Oceanides Global Sequential Batch Reactor Technology (OSBR)



OSBR Technology

SBRs are used all over the world and have been around since the 1920s. With their growing popularity in Europe and China as well as the United States, they are being used successfully to treat both municipal and industrial waste waters, particularly in areas characterized by low or varying flow patterns. Municipalities, resorts, casinos, and a number of industries, including dairy, pulp and paper, tanneries, textiles &processing units, distilleries etc... are using SBRs as practical wastewater treatment alternatives.

- Improvements in equipment and technology, especially in aeration devices and computer control systems, have made SBRs a viable choice over the conventional activated-sludge system. These plants are very practical for a number of reasons:

- In areas where there is a limited amount of space, treatment takes place in a single basin instead of multiple basins, allowing for a smaller footprint. Low total-suspended-solid values of less than 10 milligrams per liter (mg/L) can be achieved consistently through the use of effective decanters that eliminate the need for a separate clarifier.

- The treatment cycle can be adjusted to undergo aerobic, anaerobic, and anoxic conditions in order to achieve biologicalnutrient removal, including nitrification, denitrification, and some phosphorus removal. Biochemical oxygen demand (BOD)levels of less than 5 mg/L can be achieved consistently. Total nitrogen limits of less than 5 mg/L can also be achieved byaerobic conversion of ammonia to nitrates (nitrification) and anoxic conversion of nitrates to nitrogen gas (denitrification)within the same tank. Low phosphorus limits of less than 2 mg/L can be attained by using a combination of biologicaltreatment (anaerobic phosphorus- absorbing organisms) and chemical agents (aluminum or iron salts) within the vesseland treatment cycle.

- Older wastewater treatment facilities can be retrofitted to an SBR because the basins are already present.

- Wastewater discharge permits are becoming more stringent and SBRs offer a cost-effective way to achieve lower effluent limits. Note that discharge limits that require a greater degree of treatment may necessitate the addition of a tertiary filtration unit following the SBR treatment phase.

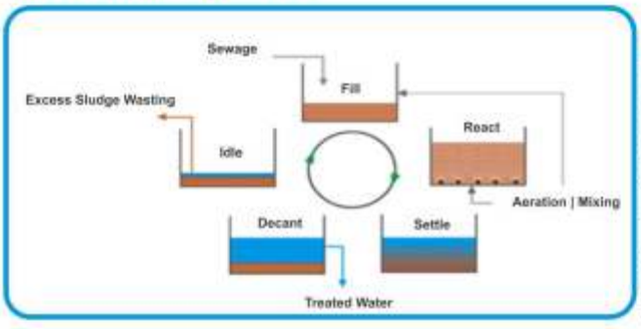
This Consideration Should Be An Important Part Of The Design Process.

TREATMENT STAGES IN OSBR:

Four steps to complete the cycle in a day as

- FILL - AERATE - SETTLE - DECANT - Additional stage of IDLE

SBR Operating Principle



Description of Various Cycles In OSBR Technology:

During the period of a cycle, the liquid or effluent or waste water is filled in the Cyclic Activated Sludge Technology Basin up to a set operating water level. Aeration Blowers are started for aeration of the effluent that mixes the effluent with biomass to react metabolically. After the aeration cycle, the biomass settles under perfect settling conditions in the settling stage. Once Settled the supernatant is removed from the top using a DECANTER. Solids are wasted from the tanks during the decanting phase.

These Phases In a Sequence Constitute a Cycle, Which Is Then Repeated.

Aerobic and facultative bacteria are the predominant micro organisms which carry out the above reaction of organic matter i.e. oxidation and synthesis (generation of CO_2 and Sludge mass).

Application of OSBR :

The technology can be applied in various applications like,

Industrial Effluent Treatment Plants for

- TEXTILES & TEXTILE PROCESSING UNITS
- DYES & INTERMEDIATES MANUFACTURING
- PHARMACEUTICALS
- BREWERIES & DISTILLERIES
- TANNERIES & LEATHER PROCESS
- PULP & PAPER MANUFACTURING
- FOOD & BEVERAGES
- FERTILIZERS

Sewage Treatment Plants for

- MUNICIPAL SEWAGE TREATMENT
- DOMESTIC SEWAGE TREATMENT



• Oceanides Moving Bed Bioreactor (OMBBR)

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Oceanides Moving Bed Bioreactor (OMBBR)



Limited water resources and increasing Industrialization & urbanization require a more advanced technology to treat the waste water from domestic usages and industrial processes and preserve its water quality. One of the important factors affecting water quality is the enrichment of nutrients in water bodies. Wastewater with high levels of organic matter like, BOD & COD as well as nutrients like Phosphorus (P) and Nitrogen (N) cause several problems, such as eutrophication, oxygen consumption and toxicity, when discharged to the environment. Biological processes are a cost-effective and environmentally sound alternative to the chemical treatment of wastewater.

Biological processes based upon suspended biomass (i.e., Activated sludge processes) are effective for organically & nutritionally rich effluents and for organic carbon and nutrient removal in municipal wastewater plants. But there are some problems of sludge settleability and the need of large reactors and settling tanks and biomass recycling and thus occupies more space and area footprints. Bio-film processes have proved to be reliable for organic carbon and nutrients removal without some of the problems of activated sludge processes. Bio-film reactors are especially useful when slow growing organisms like nitrifiers have to be kept in a wastewater treatment process. Both nitrification (NIT) and denitrification (DNIT) have been individually successful in the Bio-film reactor. There are already many different Bio-film systems in use, such as trickling filters, Rotating Biological Contactors (RBCs), fixed media submerged bio-filters, granular media bio-filters, fluidized bed reactors, etc.

They All have Advntages and Disadvantages.

Therefore, OCEANIDES GLOBAL has developed its own fixed film reactors using MBBR concept for many industrial and domestic waste water treatments that degrades the organic matter by almost 95% and nutrients with 98% and maintain pollution control boards (PCBs) stringent norms. The product OMBBR of OCEANIDES GLOBAL can utilize minimum power since it works on combination of carriers inside the reactor. It is also available in containerized & packaged forms and can be installed at the site if the demand of effluent treatment is more than 1000 m3/d. However, OCEANIDES GLOBAL offers containerized and packaged fixed film reactor for the capacity of waste water to be treated from 5 KLD to 1000 KLD.

The OCEANIDES GLOBAL expertise also offer various combination or compilation of other biological processes like, OMBBR-ASP (Activated sludge process), ASP-OMBBR, OMBBR-MBR (Membrane bio-reactor) depending on the concentrations of BOD, COD and nutrients in the effluent.

Two technologies are commonly used for biological treatment of sewage: activated sludge and trickling filters. A moving bed biological reactor (MBBR) is a compilation of these two technologies. The carriers that are being used in MBBR produce two forms of biomass as suspended flocks and a bio-film attached to carriers. It can be operated at high organic loads and it is less sensitive to hydraulic overloading. It also requires very less space comparatively. The biomass is also in its active phase of growth and can be live under nutritional starved conditions for long.

We also offer "OCEANIDES Integrated Fixed Film Activated Sludge" (OIFAS) technology using our specialized bio-carriers for revamping capacity in the existing waste water treatment plant or for the demand to assimilate more nutrients at the discharge point.

Advantages Of OMBBR Reactors

Our OMBBR is a completely mix, continuous flow through process which combines the advantage of fixed film and suspended growth processes, with its advantage include

- Compact units with small size & can be installed in limited space.
- Increased treatment capacity.
- Removes solids by 97-98%.
- It improves sludge settling characteristics.
- It is operated at very high suspended biomass
- Increases SRT (Sludge retention time) resulting in to higher sludge age
- Quite stable process during shock loading.
- Less head loss leads to minimum power consumption.
- Reduces bio-sludge production by almost 90%
- Pure or TRUE Bacterial mass and extremely less filamentous bacterial growth avoids Sludge bulking.

Applications of OMBBR/OIFAS

The OMBBR/OIFAS reactors are applicable for followings industrial effluent treatment plants like,

- Textile & Textile processing units
- Pulp & Paper industries (Agro based or Waste paper based)
- Leather & Tannins
- Slaughter houses
- Food & Beverages
- Pharmaceuticals, API Units & Drugs & intermediates & Chemical manufacturing units
- Dairy and dairy products manufacturing units
- Pesticides & Insecticides
- Distilleries & Bear manufacturing units
- Sewage treatment plants like, MUNICIPAL SEWAGE or DOMESTIC SEWAGE from Apartments, Malls, Hospitals, Restaurants, residential colonies etc....



- Oceanides Membrane Biological Process Reactor (OMBR)

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Oceanides Membrane Biological Process Reactor (OMBR)

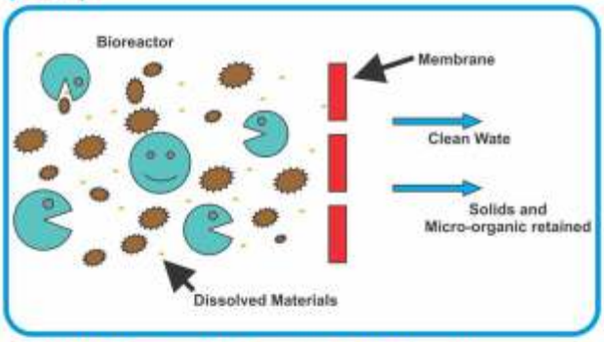


We, at OCEANIDES GLOBAL SOLUTIONS are expert in providing advanced ultra-filtration membrane technology in biological process – a suspended growth bio-reactor "OMBR" and is now widely used for municipal and industrial waste water treatment with plant sizes up to 100,000 population equivalent.

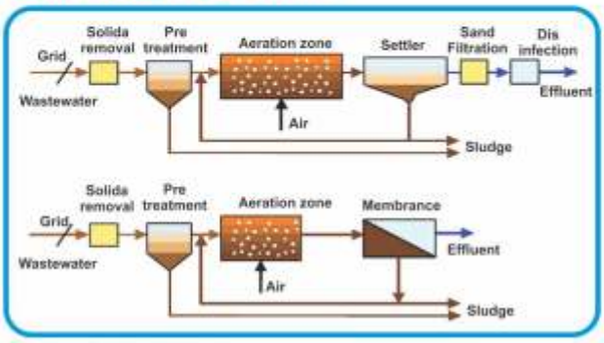
An OMBR is essentially a version of the conventional activated sludge (CAS) system,except the use of secondary clarifier. This provides a number of advantages relating to process control and product water quality.

- Air mix
- Final rinse

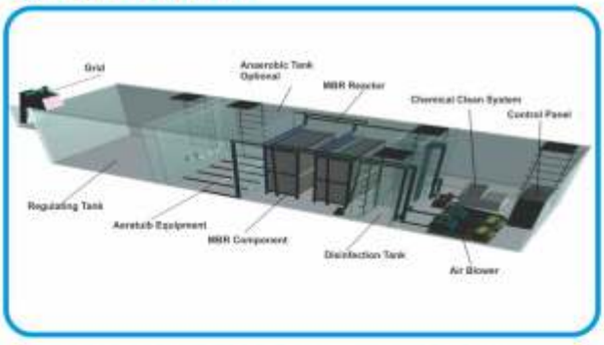
Actual Process in Membrane Bio-reactor (MBR)



Normal Process Difference Between Conventional ASP & MBR



Typical OMBR Plant



Advantages of OMBR

Uncoupling Hydraulic Retention Time (HRT) & Sludge Retention Time (SRT)

A significant advantage of the OMBR membrane process is that the sludge solids are completely retained in the bioreactor. This controls the solids retention time (SRT) in the bioreactor separately from the hydraulic retention time (HRT).

High Quality Effluent

The OMBR provides a substantially clarified and disinfected effluent of high enough quality to be discharged to sensitive receiving bodies or to be reclaimed for applications such as urban irrigation, utilities or toilet flushing.

Small Footprint

The retention of the solids and the increase in SRT to generate higher biomass solids concentrations from 6,000 mg/l to 16,000 mg/l contained in a smaller volume, such that the footprint is smaller.

Better Bio-Treatment

The OMB's higher solids retention times tend to provide better bio-treatment overall. The conditions encourage the development of the slower-growing microorganisms, specifically nitrifiers. OMBRs are especially effective at the biological removal of ammonia ('nitrification').

Undertake Shock Loading

The OMBR maintains higher concentration of sludge with higher sludge age, it can easily tolerate hydraulic and organic shock load easily without affecting the final discharge.

The OCEANIDES GLOBAL provides OMBR using different membranes in configuration like, FLAT SHEET, HOLLOW FIBER & TUBE TYPE depending on the application.

OCEANIDES GLOBAL's Strength in OMBR

- Dedicated engineering team for basic and detailed engineering
- Well trained technical expert in suggesting the membrane types
- Installed packaged containerized and decentralized MBRs in various industries
- Dedicated fabrication facilities in-house with skilled manpower

Applications of OMBR

The OMBR can be applied in almost all industrial & municipal applications where the end use requires stringent parameters like, BOD, Turbidity & TSS.

The compact and containerized plant can be suggested for STPs in malls, restaurants, hospitals, residential colonies, apartments, schools and colleges etc...



- Oceanides Nanofiltration (ON)
- Strong Acid Cation
- Oceanides Mixed Bed Demineralization (OMBD)

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Oceanides Nanofiltration (ON)



Nanofiltration is a membrane filtration based method that uses nanometer sized cylindrical through-pores that pass through the membrane at a 90°. Nanofiltration membranes have pore sizes from 1-10 Angstrom, smaller than that used in microfiltration and ultrafiltration, but just larger than that in reverse osmosis. functions similarly to reverse osmosis, but is generally targeted to remove only divalent and larger ions.

Strong Acid Cation



The water then passes through strong acid Cation unit. Then vessel is charged with strongly acidic Cation exchange resin. The cations in water are exchanged with hydrogen ions from the regenerated resin. The unit requires regeneration with Hydrochloric acid. The de-cationised water is then passed is then passed to denazifying tower.

The Strong Acid Cation (SAC) resin exchanges all cations in water. The cations associated with alkalinity or those combined as neutral salts are all removed by the SAC resin. Hence this resin is used universally in a demineralization process.

The SAC resin is used in the hydrogen form .When the in fluent water contacts the SAC resin, the cations in water exchange with hydrogen ions on the resin and this results in the production of acidic water from this exchanger.

This process continues as long as there are hydrogen ions available with the SAC. When the resins get depleted of these ions, the exchange process cannot take place and the ions present in the in fluent water appear in the product water. At this stage the resins require to be regenerated.

The SAC resin is regenerated with a mineral acid such as hydrochloric acid or sulphuric acid.

On regeneration the resins are converted back to their respective operating forms and available once again for the process of demineralization and these cycles continue.

Oceanides Mixed Bed Demineralization (OMBD)



The mixed bed demineralization process consists of SAC and SBA resins intimately mixed in the same unit to bring about the demineralization of water. In effect it is multiple and random two bed demineralizing pairs resulting in very high quality of demineralized water.

The SAC resin is in the hydrogen form and the SBA resin is in the hydroxide form.

The reactions of the SAC and SBA resins in service are the same as explained for the two bed demineralization process. But the leakage of ions, caused by the regenerative effect of free mineral acidity (FMA) or of sodium hydroxide (NaOH) formed in the exchange process, is absent in the mixed bed demineralization process. This is so because FMA generated by the SAC resin is exchanged by neighboring SBA resin; likewise NaOH generated by the SBA resin is exchanged by the adjacent SAC resin. In this manner the products of reaction of the resins are immediately removed driving the reactions to completion and the equilibrium reactions do not exist. This results in good quality of treated water and the multiple contact provides a polishing action yielding extremely pure demineralized water.

Conductivity is an importation indicator of water quality. While the two bed demineralization process produces generally DM water of conductivity 5-10 m S/cm, mixed bed demineralizing invariably yields DM water with a conductivity less than 1 m S/cm and mostly in the range 0.2 - 0.5 m S/cm

Similarly silica residual obtained from two bed demineralization are generally in the range 0.2 - 0.5 mg/l as compared to 0.02 - 0.05 mg/l commonly achieved in mixed bed demineralization.

When the treated water quality from the mixed bed is out of specification or the designed throughput is attainted, the unit requires regeneration.

The reactions of the SAC and SBA resins during regeneration are the same as given for the two bed demineralization process. But the regeneration steps require reconsideration as two different resins (requiring separate regenerates) are housed in the same unit.

The regeneration of the mixed bed consists of the following basic steps

- Backwash
- Regenerant injection
- Regenerant rinse
- Air mix
- Final rinse



- Containerized Reverse Osmosis Plant

OCEANIDES
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Containerized Reverse Osmosis Plant



This document describes the user requirements for a pre-filtaration and Reverse Osmosis containerized plant with a final product not to exceed 500ppm and better than WHO Norms

Advantages

- Product Quality as per WHO
- Minimal footprint
- Easy to maintain
- Mobile & easy deployment

Container :

The ISO container is internally with steel tubing and insulated for noise and heat in accordance to existing climatic field values creating a weather proof barrier. The system is resistant to high ambient temperatures dust, high humidity, and other destructive conditions. The system is equipped with ventilation, fire extinguishers, safety equipment, emergency eye shower and protection against hard edges. Exterior connections are made through sealed junction boxes with quick release couplings; quick disconnects, and latches for a rapid deployment.

Equipment Layout :

The plant will allow easy access for emergency maintenance and parts replacement. The equipment lay out will assist the operator in following the flow of the water throughout the system and will reduce, to a minimum, hazards inside the container. The equipment shall be laid out in such a manner that proper weight distribution is achieved.

Product Quality :

The plant will consistently produce water below 500 ppm and will meet and exceed WHO and most military requirements. The system can operate under a broader range of pressures.

Configuration :

The units can be designed for both brackish water & seawater feed.

Deployment :

The plant is designed for easy transport by road, ship or most Cargo planes, it is enclosed in a 40' ISO Container which will house all necessary equipment and will reduce the setup and deployment time.

Filtration :

Multi-media Filtration is integrated to provide the preliminary filtration. The multimedia is used in conjunction with coagulation to maintain a high level of filtration. For seawater feed we propose Ultra filtration & energy recovery are optional based on seawater analysis.

Capacity Range :

100-500m3/d
Can be offered with DG or solar power back-up for remote areas.

Raw Water :

Customized for seawater or brackish water.

Supply Time :

3 to 4 months



- Oceanides Anaerobic Technologies
- Oceanides Provide Various Anaerobic Reactor Types
- Oceanides Upflow Anaerobic Sludge Blanket (UASB) Reactor

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Oceanides Anaerobic Technlogies



Oceanides Anaerobic Waste Water Treatment Technologies

Advantage of anaerobic waste treatment systems as means for recovery of non-conventional energy is increasingly being recognized worldwide. Anaerobic decomposition is a biologically mediated process, indigenous to nature, and capable of being simulated for treating wastes emanating from municipal, agricultural, and industrial activities. Anaerobic digestion as applied in treatment of sewage sludge and other organic wastes represents the controlled application of a process. Although, anaerobic digesters have traditionally been used for many decades in the stabilization of sewage sludge, their successful and economic employment for the treatment of liquid wastes is only a recent phenomenon, arising from the development of new reactor designs. These concepts have led to development of various reactors, which are capable of retaining a much higher biomass concentration than traditional digesters. Making the sludge retention independent of the influent retention time makes this possible. The technological approaches to allow this condition of independent sludge retention time can be divided in to the following:

- Attachment of biomass on the media (filters, fluidized systems, and RBC configurations);
- Non-attached biomass concept as suspended growth process (sludge blanket reactors and contact process with sludge recycling).

Anaerobic Filter Systems

The anaerobic filter (AF) and more recent variation of the filter process, the down-flow stationary fixed film (DSFF) reactor, are packed with a fixed support media. In the DSFF reactor, the biomass is present as a bio-film attached to the support media. In the anaerobic filter, most of the biomass is present as suspended and/or entrapped biomass in the interstitial pore volume of the support media. The other major difference between these reactors is the direction of liquid flow through the packing. In the AF, the feed enters at bottom of the reactor. In the DSFF reactor, influent is applied in downward direction from the top of the rector. Both reactors can be used to treat either diluted or concentrated soluble waste waters. Because of the relatively large clearance between the channels in the vertically oriented media used, the DSFF reactor is able to treat wastewater with relatively high suspended solids while the AF cannot.

Because the bacteria are retained on the media and not washed off in the effluent, mean cell residence times of the order of 100 days can be obtained. Large values of reduction can be achieved with short hydraulic retention times, so the anaerobic filters can be used for the treatment of low-strength wastewater at ambient temperature. In the AF, most of the biological activity is due to the biomass in suspension (entrapped) rather than to the attached bio film. The media with a high capacity to entrap and prevent washout of the biomass from the reactor is more important than the specific surface area (surface area to volume ratio) of the media. The bio-film thickness of 1 to 3 mm has been observed in fixed-bed reactor. In the DSFF reactor systems, virtually all of the active biomass is attached to the support media. Different types of support media such as needle punched polyester (NPP) and red drain tile clay, PVC or glass can be used. For NPP, this attachment is probably associated with its surface roughness. The leaching of minerals from the clay could potentially stimulate bacterial activity and adhesion to this media support.

Selection of proper inoculums source is important to obtain rapid reactor start-up and minimize the time required for the initial bio-film establishment. Usually a bacterial flora adapted to the target wastewater should be used. In general, the volume of inoculums used should at least 10% (v/v) to obtained good result. During the start-up period the initial specific load applied should be maintained at levels less than 0.3 kg COD /kg VSS.d and HRT greater than 1 day should be maintained to prevent wash out of the inoculated biomass.

Typical organic loading rates generally between 1.0 and 10 kg COD /m3.d can be applied with 75 – 85 % removal efficiency. The hydraulic retention time is generally kept in the range of 18 to 24 h, but lower HRT values can also give fairly good removal efficiency depending on the type of organic matter present in the wastewater.

Expanded Bed Process

In the expanded bed process, the wastewater to be treated is pumped upward through a bed of appropriate medium (e.g. Sand, coal, expanded aggregate, plastic media) on which a biological growth has been developed. Effluent is recycled to dilute the incoming wastewater and to provide an adequate flow to maintain the bed in an expanded condition. Biomass concentrations exceeding 15,000 to 40,000 mg/L can be developed. Since more biomass can be maintained, the expanded bed process can also be used for the treatment of low strength wastewater, such as municipal sewage, at very short hydraulic retention times. Organic loading in the range of 5 to 10 kg COD / m3.d can be applied with COD removal efficiency of 80 to 85 %. The hydraulic retention time generally will be in the range of 5 to 10 hours.

Anaerobic Contact Process

The essential feature of the anaerobic contact process is that the washout of the active anaerobic bacterial mass from the reactor is controlled by a sludge separation and recycles system. The major problem in the practical application of the contact process has always been the separation (and concentration) of the sludge from the effluent solution. For this purpose several methods have been used or were recommended for use, e.g. plain sedimentation, settling combined with chemical flocculation, with vacuum degasification, floatation and centrifugation. A basic idea underlying the contact process is that it is considered necessary to thoroughly mix the digester contents e.g., by gas recirculation, sludge recirculation, or continuous or intermittent mechanical agitation.

This is generally used for concentrated wastewater treatment such as distillery wastewater.

OCEANIDES Provide Various Anaerobic Reactor Types as Below :

Basic Types of Reactors used in Anaerobic Process

Types of reactor	Synonyms	Abbreviations
Attached Biomass		
Fixed Bed	Fixed film, filter, submerged filter, stationery fixed bed	SMAR (Submerged anaerobic reactior) / ANFIL (Upflow anaerobic filter), AUF (Anaeribic upflow filter) ADSR (Anaerobic Downflow stationery bed reactor), AF(Anaerobic filter), DSFF(Downflow stationery fixed film reactor)
Moving Bed	Roatting discs, Rotating biological contactor	AnRBC, RBC
Expanded bed	Anaerobic attached film expanded bed	AAFEB
Fluidized bed	Anaerobic Fluidized bed reactor, Carrier-assisted contact process	FBBR / IFCR (Immobilized fluidized cells reactor) / CASBER (Carrier-assisted sludge bed reactor)
Non-attached Biomass		
Recycled flocks, sludge blanket, digester	Contact process, Upflow anaerobic sludge blanket reator (UASB), Upflow sludge blanket (USB) Clarigester type	UASB, USB

Upflow Anaerobic Sludge Blanket (UASB) Reactor

Modification of the Anaerobic Process

The efficient removal of organic matter from sewage can be accomplished by using conventional UASB reactor at mesophilic temperature i.e. temperature exceeding about 20 oC. For suitability of anaerobic process for wastewater treatment at lower temperature and for low strength wastewater some modification in reactor is necessary. It is possible to give treatment at lower temperature and at low strength with certain modification in conventional UASB reactor. The modification like Expanded Granular Sludge Bed (EGSB) reactor and UASB hybrid reactors are discu ssed below.

The EGSB Reactor

The sludge present inside the UASB reactor can be either flocculent or granular form. The sludge in granular form (size 1 – 5 mm) exhibits distinct advantages over flocculent sludge form. The granular form of sludge offers maximum microorganism to space ratio due to high density, it has high settling velocity, high methanogenic activity, and excellent mechanical strength. The granular sludge form develops mainly on soluble type of wastewaters. The formation of the granules is mainly dependent on operating conditions inside rector and the characteristics of the wastewater to be treated.

So far, granulation has not been reported in any of the existing full-scale UASB reactor treating sewage. Granulation of biomass is reported in the laboratory scale and pilot scale UASB reactor when appropriate mixing conditions are maintained in the reactor In all cases, although flocculent sludge configuration is reported while treating raw sewage, excellent BOD and TSS removal efficiencies can be achieved.

In EGSB reactor very high up flow velocity is maintained to keep sludge bed biomass in expanded form. It was reported that, the EGSB reactor was efficient in removal of the soluble organic matter even at low temperature. This can be attributed to the intensive contact between the incoming organic matter and sludge granules as a result of high up flow velocity (6-12 m/h), against less than 1 m/h in conventional UASB reactor. The EGSB reactors are useful for treatment of wastewater, particularly at low temperature and relatively low strength wastewater, when the production rate of biogas and consequently the mixing intensity induced by it are relatively low. Under these conditions the higher kinetic energy content of the influent and extended height of the expanded granular bed contribute to better performance compared with conventional UASB reactors. The EGSB reactor is inadequate for removal of particulate organic matter due to high up flow liquid velocity used.

UASB Hybrid Reactor

In this reactor instead of GLS separator a filter or plate settler is provided at the top of UASB reactor. Improved reactor performance can be obtained with this modification with improved sludge retention in the reactor.

This reactor is taller than the UASB reactor.





- Oceanides Packaged STP (OPSTP)
- Packaged STP - Applications
- Operation Principle
- Comparison of Packaged STP

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Oceanides Packaged STP (OPSTP)



Water is one of the world's most valuable resources. Yet it is under constant threat due to pollution, climate change and resulting drought, explosive population growth. We at Oceanides are aware that a global water crisis exists today and are working to address it. We are committed to addressing major water challenges through wastewater treatment and recycling to help communities and industry prosper.

We present a broad spectrum of packaged sewage treatment systems to handle domestic and industrial sewage originating from Large Industries, Large Commercial Complexes, Small and Medium Industries, Special Economical Zones (SEZS), Industrial Complexes, Municipal Corporations, Nagar Palikas, Hotels, Residential Colonies.

Oceanides Package Green Sewage Treatment Plant can effectively meet the demand of water in remote areas. It can be easily installed and operated and can be moved to new sites. In various environmental and municipal emergencies this plant is preferred.

"Oceanides" Sewage Treatment Plants are pre-engineered and tailor-made wastewater treatment system manufactured with prefabricated components purposely designed to meet our customer's needs. Combining versatility, efficient processing, reliability and a robust design, These packaged sewage treatment plants meets discharge standards of local regulatory Environment Agency standards, whilst minimizing visual impact on the landscape.

The packaged units work on a media based biological degradation. The specifically developed media made from UV stabilized and chemically resistant propylene offers an ideal condition for growth of micro organisms to degrade the incoming organic contaminants. The use of media also reduces the aeration tank sizes substantially thereby reducing the footprint of Sewage Treatment plant. The process air required is provided by means of twin lobe type air blower which transfers air through rugged EPDM diffusers. The media also substantially reduces the sludge generation from these units.

Packaged units come in standard modules with capacities ranging from 10 m3/day to 500 m3/day.

Standard modules facilitate a shorter delivery period. The completely pre engineered units require very less civil works and can be erected and commissioned in a short time span. The pre fabricated units are independent of site location (i.e.) in places where there is space constraint or cost of space is very high, these units can be located either on the top of the building, structures or in the basement.

Salient Features

- R structure with compact design & completely covered plant. The entire system excluding blower room will be below the ground; thus provides
- Minimum land usage option.
- STP below the ground facilitates the entire sewage flow through gravity, thus eliminates
- The entire cost for pumping of raw sewage.
- The STP tanks are made of FRP which is maintenance free.
- The Tanks which house STP are Rust proof, Leak Proof, Durable & Light Weight Rib design for tank body provides additional strength and durability to the Tank body
- No foul odour around the STP area or in the receiving environment. Sludge treatment units like Belt Filter Press, Sludge Dryers, Centrifuge, Sludge Drying
- Beds etc. are not required
- Does not require continuous monitoring and operation. Suitable even if there is uneven supply of sewage.
- MLSS and SVI monitoring not required.
- Zero Discharge.
- Colorless Treated Water.
- Odorless Treated Water. No STP odor issue even during the treatment process.
- Highly suitable for inconsistent sewage. Works well with inconsistent grey water flow.
- Overall Organic & Inorganic content reduction (BOD & COD).
- Less Sludge Production.
- Minimal sludge generation.
- 50 – 70% less power consumption compared to conventional aerobic treatment. Minimal foot Print.
- Extremely low Maintenance.
- Semi automatic and automatic plant operation.
- Treated water quality within permissible limit
- Environmentally Safe to treated sewage water dispose in Land or Water. 100% Eco friendly.

Water Recycling & Reuse Application :

- Gardening● Toilet Flushing● Landscape Irrigation● Cooling Tower
- Car Washing● Fire Sprinklers● Non potable use

Packaged Sewage Treatment Plants are ideal for the following applications

- Residential Colonies
- Software Parks
- Small and Medium Industries
- Hostel
- Apartment / Condominium
- Hospital
- National park / Zoo
- Stadium
- Places of worship
- Shopping Malls / Commercial Complex / Markets
- Hotels / Resorts / Amusement Parks
- Bungalow / Houses
- University / School
- Training Center
- Golf Course
- Factory / Workshop
- Bus Terminals / Railway Stations / Airport / Harbors

Operation Principle

SOLID SEPARATION ZONE: First stage transforms the solids in raw sewage to settled solids while allowing scum to float on the surface. It is a primary sedimentation in which settled sludge is stabilized by anaerobic digestion.

AERATION ZONE: The sewage from solid separation zone flows to the aeration zone.Air is diffused with help of air blowers which will encourage the growth of bacteria cultures in &around the floating plastic media inside the aeration zone. The PP media provides extended surface area for growth of microorganisms.

SEDIMENTATION ZONE: The next step of treatment involves the sedimentation where organic wastes are settled in the sedimentation zone. The settled waste in the bottom of the tank is pumped back to the solid separation as a return sludge ,to ensure the quality of effluent would pass the stipulated sewage parameters. chlorine is offered before discharging the effluent in to the main drainage line.

Comparison of Package STP vs. Conventional STP

Parameter	Packaged STP	Conventional STP
Space requirement	Reduced to one-third that of conventional due to increase in surface area by special media.	Large area required
Aeration & clarifying tanks	Pre-Fabricated FRP Tanks.	Civil tank (to be built by client)
Portability	Easy for relocating to other Places.	Fixed construction in civil cannot be moved.
Treated Water Quality	High Quality, can be used directly for Gardening, Cleaning, process.	May require further treatment.
Operation & Maintenance	Easy for operation and maintenance. Virtually no manpower required.	Tedious for maintenance of MLSS and achieving the end quality





- Pressure Sand Filter (OPSF)
- Dual Media Filter (DMF)
- Oceanides Multi Grade Filter (OMGF)
- Oceanides Activated Carbon Filter (OACF)
- Oceanides Softner (OS)
- Oceanides Ultrafiltration (OUF)
- Oceanides Cartridge Filter (OCAR)
- Oceanides Reverse Osmosis (ORO)

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Pressure Sand Filter (OPSF)



Feed Water shall be pumped by means of Raw Water pump into the Pressure Sand Filter.

PSF contains sand supported by gravels and pebbles as filter media, which removes the residual suspended solids from the feed water.

The direction of filtration is generally downward and the washing is upward.

The upward washing with water results in a classification of the filter material. The coarsest grains are at the bottom of the filter while the finest are at the surface

During the filtration cycle the fine filtering material retains all the matter in the incoming water and the coarsest filter material receives a cleaner water. This results in short cycles.

Dual Media Filter (DMF)



DMFIn dual media filtration, part of the fine sand is replaced by a layer of lighter material (anthracite) with an effective grain size greater than that of the sand to avoid the screening effect of the finest grains of sand and promote the penetration of impurities throughout the entire depth of the filter.

The grain size of each layer is so selected that they undergo similar expansion with the same flow of wash water thus enabling them to be reclassified at the end of each washing.

This allows distribution of the retained suspended solids. The coarsest are retained in the upper layer composed of large grains, while the lower fine-grained layer performs a polishing process.

Oceanides Multi Grade Filter (OMGF)



Multi-media filters consists of three or more different grades of media which removes the residual suspended solids from the feed water.

This improves the in-depth penetration of the impurities. But their use imposes many conditions affecting the choice of materials and the washing technique employed.

Oceanides Activated Carbon Filter (OACF)



Granular activated carbon is used after sand/anthracite filter in a second filtration stage to combat organics and most often for dechlorination to protect costly downstream systems.

Backwashing the Filter Media

Backwashing is an extremely important operation, which, if done inadequately, leads to permanent clogging of some areas resulting in only a small passage for the water. The head loss increases more rapidly and filtration is less effective. The filtering material is washed by a current of water flowing from the bottom upwards dislodge the impurities and convey them to a discharge channel. The filte material needs to be agitated for effective cleaning.

Oceanides Softener (OS)



The filtered/feed water is passed through the Softening system for the removal of the both temporary & permanent hardness present in feed water.

In this process hard water is converted into soft water. Thus the calcium and magnesium ions responsible for the hardness in the incoming water, are replaced by the less harmful and acceptable sodium ion thereby making the water soft as there is an exchange of cations with a preference for the sodium ion, a cation exchange resin in the sodium form is used in the process. The conventional resin employed for the softening process is the strong acid cation resin the sodium form as the production process continues, the resin gets depleted of sodium and saturated with calcium and magnesium. Eventually the reaction between resins & water cannot take place and hardness appears in the product water. At this stage production has to be stopped and the resin needs regeneration. Regeneration of the resin is accomplished by bringing the exhausted resin into contact with a large excess of sodium ions to effect the conversion of resin to the sodium form while the calcium and magnesium are discarded from the resin as waste in the effluent. Any sodium salt could be utilized as the source of sodium ions. Sodium chloride (common salt) is always used as a regenerate due to its availability, low cost and ease of handling. On regeneration the resin is made available again for a fresh production stage and the cycles repeat.

Reactions

The production stage of the softening process may be represented by the following reactions :

$Ca(HCO3)2(l) + 2\ NaR(s) \quad CaR2(s) + 2\ NaHCO3(l)$

$MgCl2(l) + 2\ NaR(s) \quad MgR2(s) + 2\ NaCl(l)$

Hard water Regenerated Exhausted Soft water resin resin

All ion exchange reactions are two phase solid (s) - liquid (l) reactions. R denotes the insoluble resin matrix to which is attached the exchangeable ion.

The regeneration stage of the softening process may be represented by the following reactions.

$CaR2(s) + 2\ NaCl\ (l)\ 2NaR(s) + CaCl2(l)$

$MgR2(s) + 2\ NaCl(l)\ 2\ NaR(s) + MgCl2(l)$

Exhausted Regenerant Regenerated Waste Resin (Common salt) resin effluent

Oceanides Ultrafiltration (OUF)



Ultrafiltration is a tangential flow, pressure driven filtration process that separates particles on the basis of their molecular size. Pore diameters of Ultrafiltration membranes are in the range of 10 to 200 A (0.02 to 0.001 micron).

Solvents and species having a diameter smaller than the pore size of the membrane will pass through the membrane and emerge as ultrafiltrate known as permeate. Rejected species are progressively concentrated in the retained stream. Ultrafiltration membranes are reusable and cleanable with standard chemicals.

Ultrafiltration of process water provides,

- Removal of virtually all-particulate matter, suspended solids, bacteria, viruses and pyrogenic species from pharmaceutical and industrial process water.
- Removal of colloidal material (non-reactive silica, iron, aluminium etc).
- Removal of high molecular weight organics.

Ultra filtration skids are backwashed by back flush pumps. UF system shall be cleaned periodically by using cleaning chemicals like NaOCl,HCl NoOH. Wastewater generated during chemical cleaning needs neutralization before disposal,

Oceanides Cartridge Filter (OCAR)



The chemically conditioned water is then feed to micron cartridge filter having cartridges of 5 micron nominal rating. Purpose of this cartridge filter is to basically remove very fine particles. This will also work as a safe guard of SDI. The water from cartridge filter will then be passed to RO unit by means of high-pressure pump to get the RO product water.

Oceanides Reverse Osmosis (ORO)



Reverse Osmosis (RO) is another Main Treatment that converts an available source of water to usable product water.

The conversion of `salt' water to `sweet' water takes place through a semi-permeable membrane under the application of pressure.

As the name implies, RO is the opposite of osmosis which is the flow, of solvent molecules from a dilute solution to a concentrated solution when separated by a semi-permeable membrane, driven by the osmotic pressure of the solution. By applying a pressure higher than the osmotic pressure of the solution, the flow of solvent molecules is reversed from the concentrated solution to the dilute solution to effect the separation of solvent molecules from the concentrated solution.

Thus when salt water is pumped across a semi-permeable membrane at a pressure greater than the osmotic pressure of the salt water, there is a flow of water molecules from the salt water through the membrane thereby producing sweet water on the other side of the membrane and leaving a concentrated salt solution on the feed side of the membrane and which is rejected to drain. In this manner the conversion of salt water to sweet water takes place and a product water with low mineral content is obtained from a feed with a high salt content using pumping energy.

RO is widely used to desalt water with a mineral content in excess of 1500 mg/l. it may be used in the lower limits down to 500 mg/l depending on economics and other environmental conditions. In this range it competes with electro dialysis and ion exchange. RO substitutes multistage flash distillation in the lower capacity ranges for seawater desalination.

RO is employed before Ion Exchange to reduce the ionic load on the resin. And there are cases when Ion Exchange is used prior to RO to condition the RO feed water.

For the smooth functioning of the RO membrane, it is necessary to pre treat the source by one or more pretreatment processes such as oxidation, coagulation-flocculation, precipitation, clarification, disinfection and filtration. After this initial pretreatment, the water is further conditioned by dechlorination, acid addition, polymer dosing and fine filtration to provide a particular quality of feed water to the membrane.

The following are the general limits of feed water quality to a RO membrane

pH 2-10

Temperature ° C 40

Turbidity NTU < 1

Silt Density Index SDI15 < 4

Heavy metals (Fe, Mn) mg/l < 0.1

Free Chlorine mg/l Nil

Oil and grease mg/l Nil



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