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MBR UF VS. SBR

**A PROACTIVE APPROACH TOWARDS
SEWAGE WATER TREATMENT IN
SITUATIONS OF PANDEMIC LIKE COVID 19
SARS NCOV 2 FOR DISCHARGE AND
RESUSE STANDARDS**

MR. REEPAL JOSHI

DIRECTOR MARKETING

Contributing to



ORGANIZATION INFORMATION

LAB SYSTEMS AND BIOTECH INDIA PVT. LTD. is more than 24 years rich in experience Organization in the field of Measurement Analytics. With couple of Business Units as Business Verticals, the Organization has always delivered Quality and Sustainable Solutions to their Customer Partners.

ENVIRONMENTAL ANALYTICS AND SOLUTIONS is one of the business units that is Powered by the rich technical expertise in the field of measurement analytics catering to WATER and AIR. With the Philosophy of DEFINE, MEASURE AND APPLY the company caters to solutions for precise measurement of polluting analytes and matrices in real time. The Organization also offers Quality Solutions that supports Water Treatment, Re Cycling and Re Use.

Our Products and Solutions for Process Control and Compliance:

1. Instrumentation for measurement of parameters like Level, Flow, Temperature, Pressure etc.
2. Reagent less Laboratory COD, BOD, TOC, TSS, NO₃, NO₂ Analyzers for Drinking and Potable Water, River Water, ETP and STP Water (Full Spectrum High Resolution UV-VIS Spectrometer).
3. Reagent less Online COD, BOD, TOC, TSS, Nitrate, NO₃, NO₂ Analyzers for Drinking and Potable Water, River Water, ETP and STP Water (Full Spectrum High Resolution UV-VIS Spectrometer)
4. Digital Sensors for Online Measurement of Parameters like pH, TDS /Conductivity, DO, Turbidity, TSS, NH₃, Chlorine, etc.
5. Online Analyzer Solutions for Measurement of Colorimetric analytes like Chromate, Silica, Hardness, Chlorides, Color, Cyanide, Phosphate etc.
6. Online Analyzer Solutions for Measurement of Specialized Parameters in Water like Algae Species, Toxicity and Total Bacterial Count.
7. Treatment Solutions like Fine Bubble Disc Diffusers, Tube Diffusers, Plate Diffusers and Ultra Filtration based MBR Membranes, Vertical Cloth Disc Filter, Electro Coagulation Units and Complete ZLD Solutions.
8. USEPA Validated Medium Pressure UV Disinfection System that offer 6 Log deactivation of Microbes and 4 Log reduction of Adeno Virus as Tertiary Treatment for Process Water.
9. Solutions for Online Measurement of Parameters for Ambient Air and STACKS etc.

Directors and Team of Helm

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MISSION

Through continuous update and innovation and introduction of new technologies and solutions for a more cleaner future,. We aim to meet the highest standards of accuracy, precision and sensitivity, from frontier market research. Our high end quality solutions and services cover the complete spectrum with long Term value for money that Complies all stringent regulatory compliance and also ready to comply the future changes.

We are committed to provide the highest level of customer satisfaction and continually contribute in improving the quality of our products and services. We therefore welcome any customer suggestions, which we would evaluate and subsequently implement for the benefits to assist you in our drive forward to enhance our future performance.

In all our interactions, we help you to identify such initiatives that would make your company a cutting edge and competitive organization implementing more professional and ethical business practices.

Lab Systems & Biotech India Pvt. Ltd has been following simple philosophies since more than 2 decades. To continuously keep Introducing innovation and new state of art technologies and solutions that will help in building more cleaner and vibrant tomorrow

To make Environmental Analytics and Solution, the product of choice for all its users and customers in the field of Environment. To provide the highest quality product deliverable and to narrow down on solution specifications, for the analytical users.

To utilize the most advanced technologies for promotion of our high end solutions. To be focused on meeting the needs of our customers on regular basis. Integrity in dealings, Innovativeness in approach, Excellence in results



VISION

“To be a recognized Brand Image not only as Solution Providers but also as support partners to make Lab Systems and Biotech India Pvt. Ltd the product of choice for all its users and customers”

Let us all together take Lead to protect our today and to make a better and cleaner Environment for tomorrow.



MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

WATER AND WASTE WATER SOLUTIONS,
TECHNOLOGY PARTNERS



Gesellschaft für Umwelt-
und Verfahrenstechnik mbH

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

**A PROACTIVE APPROACH AND INITIATIVE TOWARDS
DOMESTIC WASTE WATER TREATMENT FOR DISCHARGE
AND REUSE STANDARDS IN PANDEMIC SITUATIONS LIKE
COVID 19 SARS nCOV2 ENSURING HIGHEST SAFETY
STANDARDS AND CONFIDENCE**

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

AGENDA

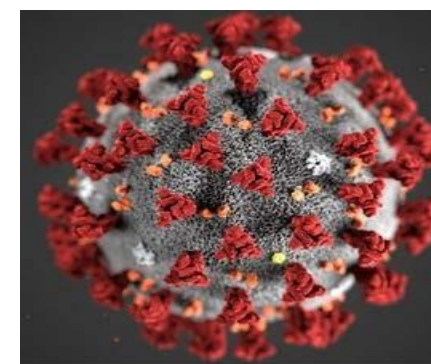
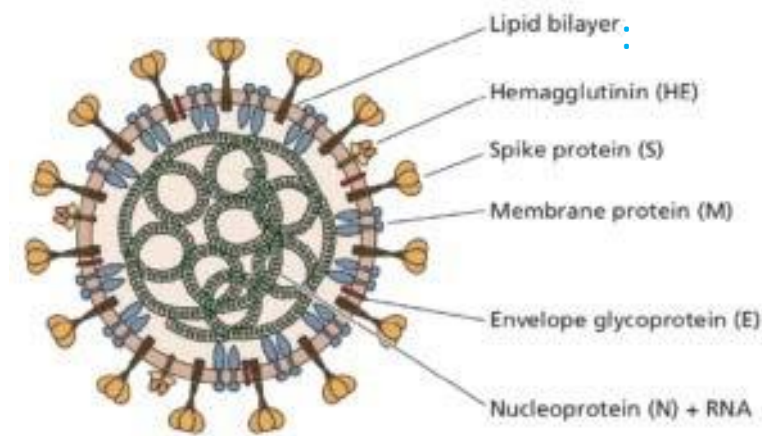
- Brief about Pandemics **COVID 19 Corona Virus SARS nCOV 2**
- Impact Assessment on Water and Waste Water
- CPCB Directives
- MBR (UF) Vs. SBR Technology Advantage
 - Reduced Foot Print
 - Superior Effluent Quality
 - Reduced Sludge Productions
 - Ease of Operations
- Conclusion – Why Prefer MBR (UF) over SBR in the situations of Epidemics and Pandemics like COVID 19
 - Supratec FLAT SHEET UF Membrane – Key Advantages

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

SOURCE

BRIEF COVID 19 CORONA VIRUS, SARS nCOV 2

- A large virus with a lipid outer envelope
- Size: approx 0.12 micron
- Similar to SARS and MERS coronaviruses
- Zoonotic (goes from animal hosts to people)
 - Bats are main reservoir hosts; arose by mutation
 - Other wild animals caught for food and medicines are hosts that often transmit coronaviruses to people
- Pangolins (scaly anteaters) ?
- First discovered in December 2019 in a Wuhan city, Hubei Province, China “wet” (live animal) market
- Has now spread within China and to many other countries (~39) by infected people



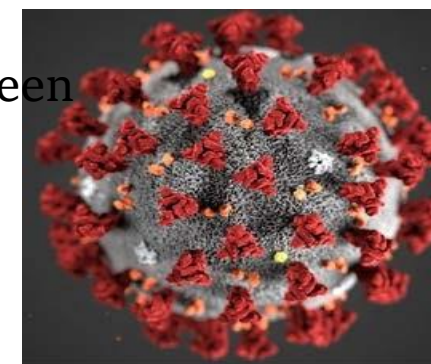
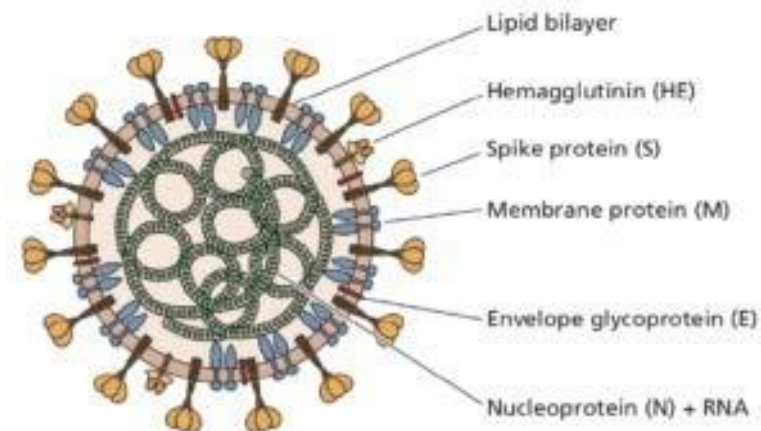
Size: approx 0.12 micron

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

SOURCE:  UNC
GILLINGS SCHOOL OF
GLOBAL PUBLIC HEALTH

BRIEF COVID 19 CORONA VIRUS, SARS nCOV 2

- 2019-nCOV is a biosafety level 3 pathogen; a high risk agent
- Requires high level containment in specialized labs with trained staff
- Detection is usually by nucleic acid amplification & detection – reverse transcription-polymerase chain reaction (RT-PCR)
 - Detects viral nucleic acid and NOT infectious virus
- Can detect inactivated viruses & bits of virus nucleic acid
- Does not prove infectious viruses are present; maybe?
- Detection of infectious 2019-nCOV in a fecal sample by cell culture has been reported
- Virus concentration in the sample was not reported.
- Therefore, concentrations of infectious 219-nCOV in clinical and environmental samples remains unknown at this time.
- More efforts needed to determine infectious virus concentrations



Size: approx 0.12 micron

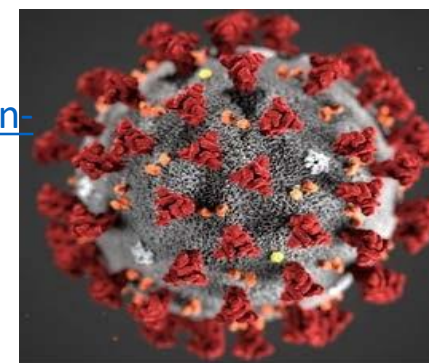
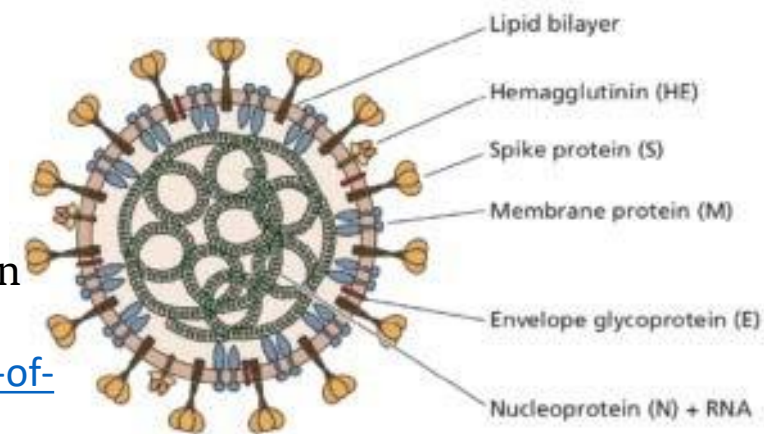
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MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

SOURCE:  UNC
GILLINGS SCHOOL OF
GLOBAL PUBLIC HEALTH

IMPACT ASSESMENT ON WASTE WATER AND WATER

- Detection of infectious 2019-nCoV in a fecal sample by cell culture has been reported in China. See:
- <http://weekly.chinacdc.cn/en/article/id/ffa97a96-db2a-4715-9dfb-ef662660e89d>
- Detection of infectious 2019-nCoV in a Municipal Sewer sample has been reported in Netherland. See:
- <https://www.dutchwatersector.com/news/sewage-water-as-indicator-for-spreading-of-covid-19>
- Detection of infectious 2019-nCoV in a canal water sample has been reported in Paris. See:
- <https://www.thelocal.fr/20200421/has-coronavirus-really-been-found-in-the-water-in-paris>
- Virus concentration in the sample was not reported.
- Therefore, concentrations of infectious 219-nCoV in clinical and environmental samples remains unknown at this time.
- More efforts needed to determine infectious virus concentrations



Size: approx 0.12 micron

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

SOURCE:  UNC
GILLINGS SCHOOL OF
GLOBAL PUBLIC HEALTH

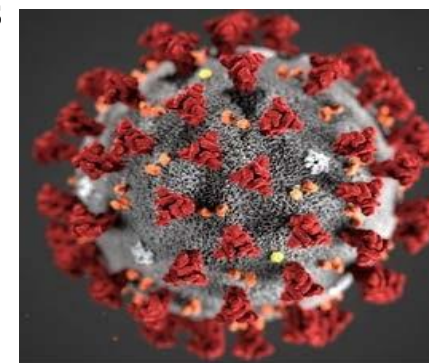
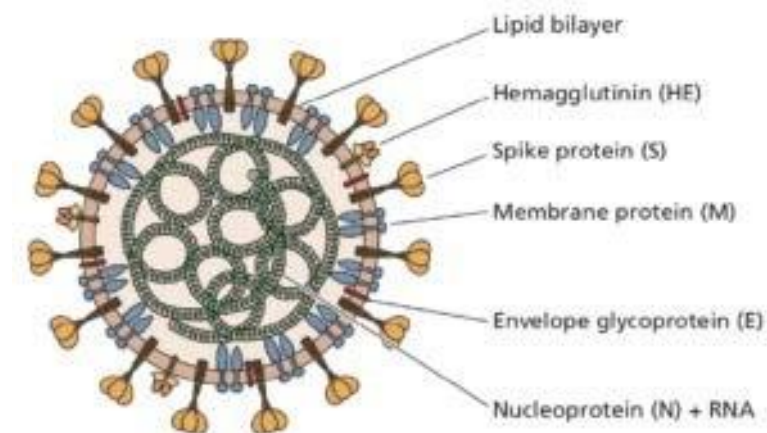
IMPACT ASSESMENT ON WASTE WATER AND WATER

Presence:

- 2019-nCoV concentrations in feces, sewage or water are unknown
- Concentrations of other CoVs, such as SARS and “common cold” CoVs in some samples are known
 - Whether predictive of 2019-nCoV concentrations is unknown

Survival:

- 2019-nCoV survival in feces, sewage, water and other media is unknown
- Survival of other CoVs, such as SARS, “common cold” and animal CoVs is known for some media (sewage, water, surfaces and some foods.
 - Assumption: Survival of other CoVs may be predictive of 2019-nCoV survival. Animal CoVs and common cold COVs
 - For now, such CoV survival data is considered informative



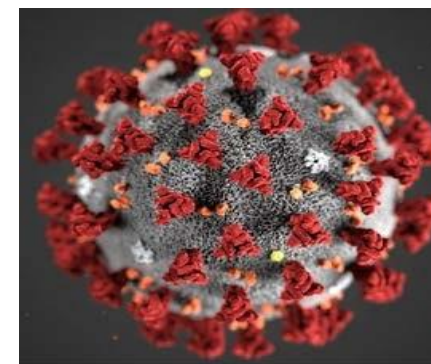
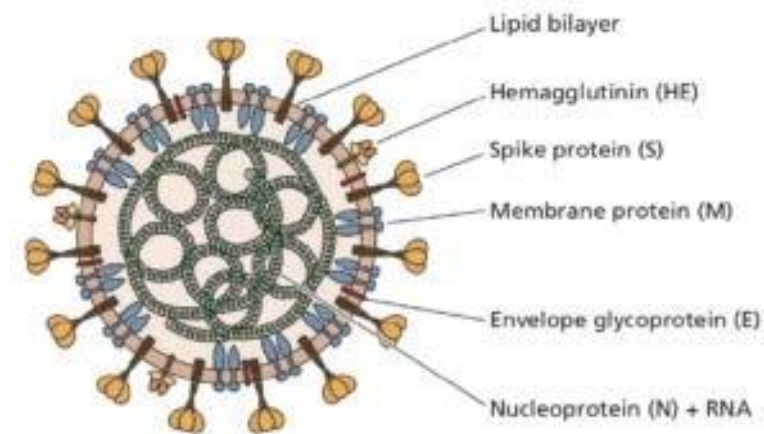
Size: approx 0.12micron

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

SOURCE:  UNC
GILLINGS SCHOOL OF
GLOBAL PUBLIC HEALTH

IMPACT ASSESMENT ON WASTE WATER AND WATER

- 2019-nCoV may be expected to survive for extended periods of time in environmental media
- Inactivation is not immediate or very rapid
- Extensive declines of virus infectivity are expected over several days or weeks in aqueous media (sewage & water), depending on temperature, matrix/medium and other environmental conditions
 - On environmental surfaces, extensive declines of virus infectivity are expected in hours, days or weeks, depending on the matrix/medium, surface and environmental
 - Conditions
 - Data on disinfection of 2019-nCoV is not available yet
 - Disinfection data on other CoVs indicates susceptibility to a range of chemical disinfectants and UV radiation (UVC)



Size: approx 0.12 micron

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

CPCB DIRECTIVES

Total Coliform is already a parameter of measurement for Treated Sewage Water Post Treatment as per Latest Guidelines of CPCB and NGT for Treated Municipal Water Disposal and Reuse

The New Circular by Central Pollution Control Board (CPCB)

Virus can spread through sewage systems: CPCB

Pollution body advises sewage treatment plant operators to use PPEs

RICHA SHARMA @New Delhi

CAN COVID-19 spread through sewerage systems? The guidelines issued by the country's top pollution watchdog say transmission to operators may be possible during treatment of Sewage Treatment Plants (STPs) and has called for use of Personal Protective Equipment (PPE).

Issued by the Central Pollution Control Board (CPCB), the Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/Quarantine of COVID-19 Patients also says that there is no evidence as of now that coronavirus spread through sewerage systems has occurred.

In Paris, French authorities

had found "minuscule traces" of coronavirus in non-potable water like water supply used for cleaning streets.

"As per the information available at CDC (Centres for Disease Control and Prevention), the risk of transmission of virus that causes COVID-19 through sewerage systems is thought to be low. Transmission to operators may be possible during treatment of STPs," said the guidelines.

"Operators of Effluent Treatment Plants/Sewage Treatment Plants attached with discharge from Healthcare Facilities and isolation wards should adopt standard operational practices, practice basic hygiene precau-



tions, and should wear (PPE) — goggles, face mask, liquid repellent coveralls, waterproof gloves and rubber boots," the CPCB said adding, that during the period of COVID-19 pandemic, utilisation of treated wastewater in utilities within healthcare facilities may be avoided.

The guidelines talks about management of general waste from quarantine homes and masks/gloves from other households. It says used masks and gloves generated from home quarantine or other households should be kept in paper bags for a minimum of 72 hours prior to disposal as general waste. Users are advised to cut the masks prior to disposal to prevent reuse.

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

CPCB DIRECTIVES

TYPICAL IMPORTANT PRIMARY WATER QUALITY CRITERIA FOR BATHING WATER

CRITERIA RATIONALE (SOURCE: CPCB ENVIS NEWS LETTER 2015 JAN TO APRIL ISSUE)

- 1. Total Coliform (MPN/100ml) 50**
- 2. Fecal Coliform (MPN/100ml) <1.8 Fecal Coliform is considered as they reflect the bacterial pathogenicity through human origin. Presence of Fecal Coliform renders the river water unsuitable for drinking purposes. To ensure no fecal contamination in drinking and bathing waters.**
- 3. Fecal Streptococci (MPN/100ml) <1.8 Fecal streptococci are considered as they reflect the bacterial pathogenicity through animal origin. To ensure no fecal contamination in drinking and bathing waters.**
4. Bio-chemical Oxygen Demand 3 days, 27°C 3 or less The Bio-chemical Oxygen Demand of 3 mg/l or less of the water ensures reasonable freedom from oxygen demanding pollutants and prevent production of obnoxious gases.
7. Chemical Oxygen Demand (COD) mg/l <10 mg/l To ensure no contamination from industrial source after treatment.
8. Colour (Hazen) 10-20 To ensure that colored water is undesirable for drinking and bathing purposes.
9. Odour No noticeable offensive Odour Specially caused by chemical compound like creosols, phenols, naphtha, pyridine, and benzene, toluene etc. causing visible coloration of water and tainting of and odour in fish flesh.

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

CPCB DIRECTIVES

TYPICAL IMPORTANT PRIMARY WATER QUALITY CRITERIA FOR BATHING WATER CRITERIA RATIONALE (SOURCE: CPCB ENVIS NEWS LETTER 2015 JAN TO APRIL ISSUE)

11. Floating Matter Nothing Obnoxious or detrimental for use purpose. None in such concentration that would impair usages specially assigned to this class.
12. Floating Materials, Oil, grease and scum (including Petroleum Products) <10 mg/l
13. Sludge deposits, Solid refuse floating solids, oil grease and scum None except for such small amount that may result from discharge of approximately treated sewage and or industrial waste effluents
14. **Suspended Solids mg/l <10 from sewage or industrial waste origin. None in such concentration that would impair usages specially assigned to this class. Many places bathing water is utilized for hydro power generation where more than 10 mg/l of Suspended Solids, are unsuitable and chock the turbines.**
15. Turbidity NTU (NephaloTurbidity Unit) Measured at 0.9 depth Turbidity in water is caused by suspended and colloidal matter such as clay, silt finely divided organic and inorganic matter, and plankton and other microscopic organisms.



MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

MBR Vs. SBR TECHNOLOGY BRIEF.

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

Comparing MBR (UF) and SBR Technologies Brief

While there are similarities between MBR and SBR (both are forms of the activated sludge process), there is one fundamental difference – the method of separating the mixed liquor from the treated wastewater.

SBR technology relies on gravity settling (or phase separation),

while MBR technology uses the membrane as a physical barrier for separation.

On the surface this may seem like a subtle difference, however, by using a physical barrier for separation, **MBR technology provides numerous advantages.**

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

The MBR (UF) Advantages

Reduced Footprint

One of the benefits of MBR technology over other activated sludge processes is its ability to operate at high biomass concentrations (MLSS). **A typical MBR design will operate at an MLSS of 12,000 mg/l**, while **a typical SBR design will have an MLSS in the range of 3,000 mg/l**. This difference in biomass concentration leads to much smaller process basins for MBR technology, and results in the

MBR system having an overall plant footprint 50 – 70% smaller than an SBR system.

Further, because it relies on phase separation, **the SBR cannot operate at elevated biomass concentrations, as the sludge loses its ability to settle into distinct layers once the MLSS gets above 6,000 – 8,000 mg/l**. Settling characteristics are not relevant with MBR technology because it utilises a physical barrier for separation.

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

The MBR (UF) Advantages

Superior Effluent Quality

During operation, the effective opening of the Ultrafiltration membrane is less than $0.1\mu\text{m}$. ($0.03\mu\text{m}$ in case of Supratec UF Membranes)

The membrane achieves 5 to 6-log removal of bacteria and 3 to 4-log removal of virus without disinfection. Effluent turbidity is < 0.2 NTU, which means TSS almost NIL (TSS are at times carriers of Microbes and Viruses).

SBR technology, even when followed by tertiary filtration, won't achieve values this low.

The typical opening for most tertiary filters (like Disc Filtration and Micron Filtration) is on the order of $10\mu\text{m}$, 100x larger than the membrane. In this regard, MBR technology reduces the burden on the final disinfection system (typically UV or Chlorine).

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

The MBR (UF) Advantages

Reduced Sludge Production

An MBR system will produce less waste sludge than an SBR system.

The reason for this is the MBR's ability to operate at much longer sludge retention times (SRT).

Again, the reason a SBR can't operate at longer SRTs is the negative impact on the settling of sludge.

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

The MBR (UF) Advantages

Ease of Operation

Ease of operation is often the least appreciated aspect of MBR technology.

Put simply, eliminating phase separation (sludge settling) from the process greatly reduces the operator oversight required to keep the system running efficiently.

Most operators of activated sludge facilities will tell you they spend the majority of their time focused on the settling characteristics of the sludge at their plant. There are many factors that impact settling characteristics and these can change from one day to the next. Not only does this require time spent in the lab analysing sludge samples, but also subsequent adjustments to the plant (i.e. adjusting process cycles in an SBR) to maintain good settling characteristics. If the sludge doesn't settle into a distinct layer, the plant runs the risk of compromised effluent quality. Again, this lab and plant adjustment work is greatly reduced with an MBR system since settling of sludge is not an issue.

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

The MBR (UF) Advantages

Conclusion

To achieve reuse quality water, the SBR system will need to be followed by a higher level and complexity of tertiary filtration system, than a MBR system.

By comparison, in many cases MBR technology may not require tertiary filtration or further treatment processes to meet required standards for microbial/viral load, suspended solids and turbidity as per latest Guidelines of CPCB/NGT for water re-use for gardening, discharge to river or bathing purpose.

This reduction in the number of unit processes further improves system reliability and reduces process oversight by the operator.

Further indicating the ease of operation, MBR installations may be monitored and maintained from a remote location, utilising the full SCADA control systems

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

The MBR (UF) Advantages

Conclusion

There is nothing wrong with the SBR technology approach

If there are no reuse considerations on a project, and no footprint constraints, then SBR technology can be a cost-effective choice.

However, the majority of clients will benefit from the reduction in unit processes and lower operational requirements for the MBR, and know that the high quality effluent and reduced footprint will help them meet future growth and permit requirements better than any other technology on the market, Especially in case of current Pandemic like COVID 19 SARS nCOV2 and past water borne epidemics like Noro Virus Outbreak in Europe, Plague in Europe, china and Asia, and many other microbial and viral transmissions

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

The MBR (UF) Advantages

Conclusion

With Oldest Infrastructures in place where treated Sewage discharge lines and closely associated to drinking water lines, with threat of Epidemics and Pandemics like **COVID 19** always rolling around mankind, with re-use of water which is the need of an hour due to scarcity of water resources, re-used water quality for gardening, industrial re-use, agriculture, bathing and may be in the future drinking water quality calls for safe, reliable and sustainable technology for treatment of sewage water to reuse quality with very highest level of confidence

MBR (UF) treatment carries much higher benefits for Domestic Sewage Waste is the need of an hour and continues to be the choice of today and for future when compared to SBR Technology

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

The MBR (UF) Advantages - Supratec FLAT SHEET MEMBRANES



MBR (MEMBRANE BIO-REACTOR) WITH PVDF FLAT SHEET UF MEMBRANE WITH 0.03 MICRON PORE SIZE

- No sludge accumulation
- Higher Anti-fibre capacity
- No fibre-broken phenomenon
- Permeate backflushable
- Minimized chemical cleaning demand
- Highest footprint density in flat sheet
- One of the biggest module membrane surface
- High flux for the whole life
- Innovative double module layers possible
- The most energy saving MBR in the world
- Low on opex

MBR (UF) Vs. SBR TREATMENT FOR SEWAGE WATER

The MBR (UF) Advantages - Supratec FLAT SHEET MEMBRANES



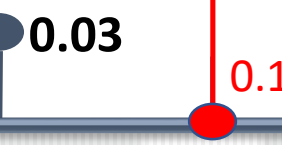
MBR (MEMBRANE BIO-REACTOR) WITH PVDF FLAT SHEET UF MEMBRANE WITH 0.03 MICRON PORE SIZE

- **Submerged Ultra Filtration Membranes with PVDF MOC offering 0.03 micron pore size for optimum removal of TSS, Microbes and TSS Carrying BOD and Microbes**
- **FLAT SHEET Membrane design with breaching offering highest quality and very long service life**
- **MADE IN GERMANY** in a fully automated plant ENSURING HIGHEST BATCH TO BATCH REPEATABLE QUALITY OUTPUT.
- **World leaders in FLAT SHEET manufacturing and supply**

Membrane pore size

0.0001 | 0.001 | 0.01 | **0.03** | **0.1** | 1.0 | 10 | 100 | 1000 μm (log)

UF ← MF



Metal

Dissolved salt

Pesticide

Virus

Bacteria

Coal Dust

Crypto spores

Jade Worm

Sand

UF Membrane: 0.02 – 0.08 μm

Large flux and not easy to contaminate

Long service life

Little amount of scrubbing air needed.

UF



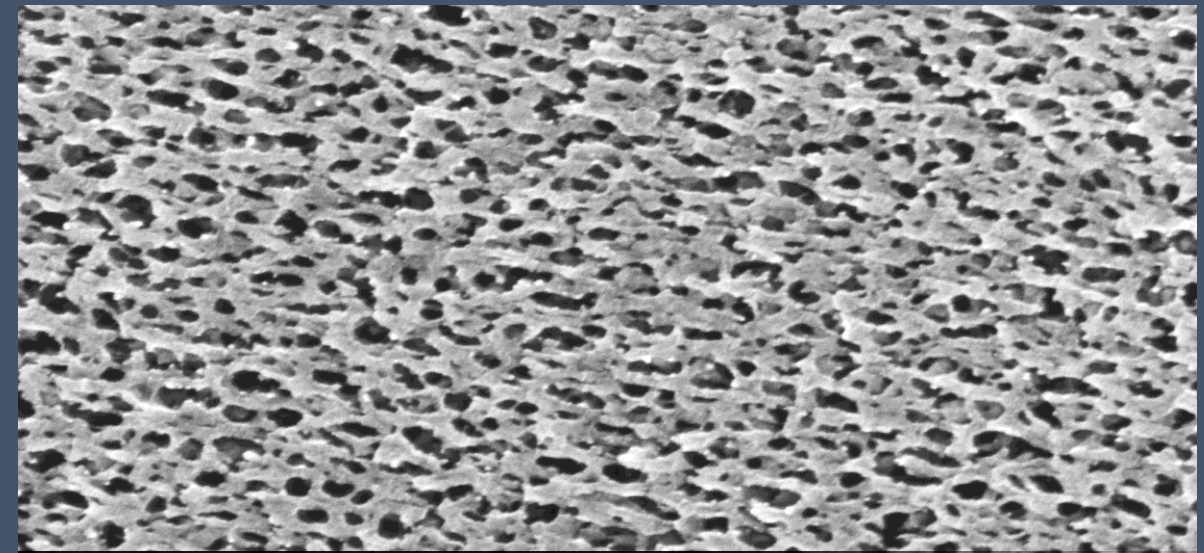
MF Membrane: 0.2 – 0.8 μm

Easy to be polluted and blocked

Large scrubbing air volume

Short service life

MF



Supratec UF Membrane

400 nm



THANK YOU FOR YOUR KIND ATTENTION



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Do you have any Questions??

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