



PROCESS DESCRIPTION

Membrane bioreactors (MBR) are activated sludge processes where the final gravity clarifier is replaced with a filtering membrane.

MBRs produce a high-quality effluent that can be discharged to river, ocean, or environmentally sensitive areas, but it can also be recycled for recreational field irrigation, agriculture, artificial waterfalls and recreational pond makeup, nonpotable domestic use, cooling tower makeup, vehicle washing, fire protection, dust control, construction, etc.

MBR SYSTEM BENEFITS

- Excellent effluent quality allows water recycling or direct discharge in sensitive environments
- Small footprint (50% approx.) compared with other activated sludge processes
- Low disinfection doses are required as most bacteria and viruses (>98%) are retained by the membrane

TYPICAL MBR EFFLUENT QUALITY

- Suspended Solids (TSS) < 2 mg/L
- Turbidity < 1 NTU
- COD < 30 mg/L
- BOD < 3 mg/L
- Nitrogen as NH₄-N < 1 mg/L
- TN < 5 mg/L
- TP < 1 mg/L
- Faecal coliforms < 100 (count in 100 mL)

MAIN COMPONENTS

- Equalization Tank: Flow equalization is a crucial step to secure efficient use of the entire system without causing hydraulic or organic overloads. It is sized on a project basis to buffer peak flows.
- Aeration Tank: where various microorganisms cooperate to oxidize biodegradable organics and nitrogen. Approximately 30% to 60% of the carbons in the biodegradable organics are assimilated to live microorganisms while the rest of them are oxidized to CO₂. Organic and inorganic nitrogen are also oxidized to nitrate.
- Anoxic tank: removal of nitrogen is enhanced when molecular oxygen (O₂) is not present for bacterial respiration and combined oxygen contained in nitrate (NO₃ -N) is used as an alternative oxygen source. Molecular nitrogen (N₂) is then released.
- Microfiltration Membrane: with a typical pore size of 0.4 microns, the filtration membrane provides a physical barrier to organic and inorganic matter suspended in the water as well as bacteria and viruses.

OPTIONAL COMPONENTS

- Advanced phosphorus removal: more than 80% of the total incoming phosphorus is typically removed by the standard MBR process. When more stringent removal rates are required, alum and ferric coagulants can reduce the phosphorus concentration in effluent down to 0.04 mg/L
- Advanced non-biodegradable COD removal: when influent contains high levels of non-biodegradable COD, PAC can be added to the aeration tank.
- Effluent disinfection (post-treatment): typical MBR virus and bacteria removal is >98%. Additional effluent disinfection can be achieved by chlorination and/or UV.

CRITICAL PLC CONTROLLED PARAMETERS

- Chemical Oxygen Demand (COD): two sensors, located in the influent and effluent sides, compare and log COD values and plant efficiency.
- Dissolved Oxygen (DO): required for biodegradation of BOD and nitrogen, it also represents a 30% of the overall power consumption.
- Oxidation-reduction potential (ORP): used to monitor and control anoxic and anaerobic conditions.
- PH: critical for biological growth

