

EfloMBR

Membrane Bio Reactor

EfloMBR 15,000 m³ per Day



EfloMBR Benefits

Submerged Flat Sheet Membranes

VDF Permeate Suction Pumps.

Nominal Pore Dia. 0.08μm

PVDF Membrane.

Normal Flux 0.7 m/d

MLSS 7,000 - 18,000 mg/l

Membrane Working Area 1.4 sq.m

Membrane Frames : ANSI 316 st. st.

Effluent Quality BOD, TSS, NH₄-N: < 3 mg/l, < 2 mg/l, < 1 mg/l

Very compact treatment plants

Eflo Constant Transfer avoids need for Equalisation Tanks

Low sludge production

No Hair and Fibre Fouling

Clean In Place CIP Membranes.

Auto Air Diffuser Purging

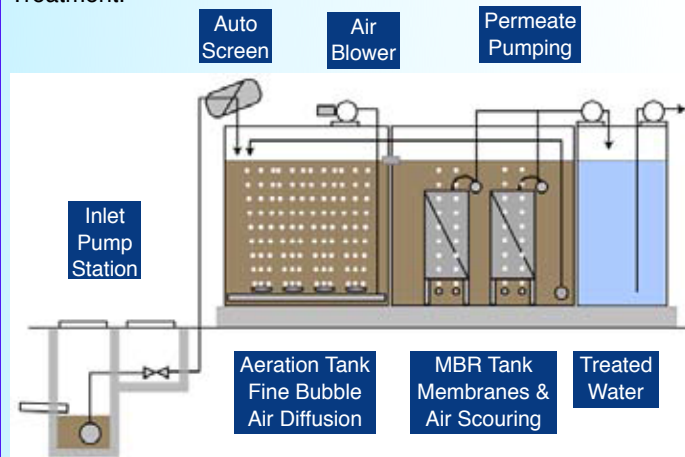
Extended Membrane Life

50 - 50,000 m³ per day

Ready to Run Package Plants
Factory Built Containerised

General Description

The Membrane Bio Reactor MBR is a development of the well known activated sludge process. Remarkably, the MBR dispenses with the need for both Primary Settlement and Final Settlement Tanks. Further, the foot print of the plant is significantly reduced whilst the final effluent quality is improved far beyond that of a conventional WWTP with Tertiary Treatment.



The limiting factor in a conventional activated sludge plant is the performance of the final settlement tanks. If the biomass concentration in the aeration tank is allowed to rise too high, typically above 3500 mg/l, then the settlement tank will fail, allowing solids to pass out of the plant with the effluent.

In the MBR plant, membranes in the micro/ultra filtration range are used to separate the biomass from the treated water. This allows the biomass concentration in the aeration tank to be raised significantly, reaching 15,000 mg/l whilst retaining an F/M ratio of 0.1 - 0.15. Therefore, the biological treatment volume can therefore be reduced five or six fold. This significant reduction in volume plus the elimination of the settlement tanks makes the MBR very compact.

Eflo - About Us

Eflo International Ltd, UK is an OEM company offering proven and robust technologies for advanced wastewater treatment systems for both domestic and industrial waste water.

Eflo also designs and manufactures reverse osmosis plants for sea water and brackish water desalination delivering these as ready to run packaged plants in either skid for or containerised.

Eflo has designed & installed treatment plants in Europe, the Middle East, Africa, Caribbean the Indian Ocean islands over a period of more than 40 years and can delivery globally through local agents who provide product support.

Eflo offers a range of other innovative water treatment products including oily water separation and DAF processes as well as water treatment chemicals

Please contact us so we can help you with your water treatment requirements.

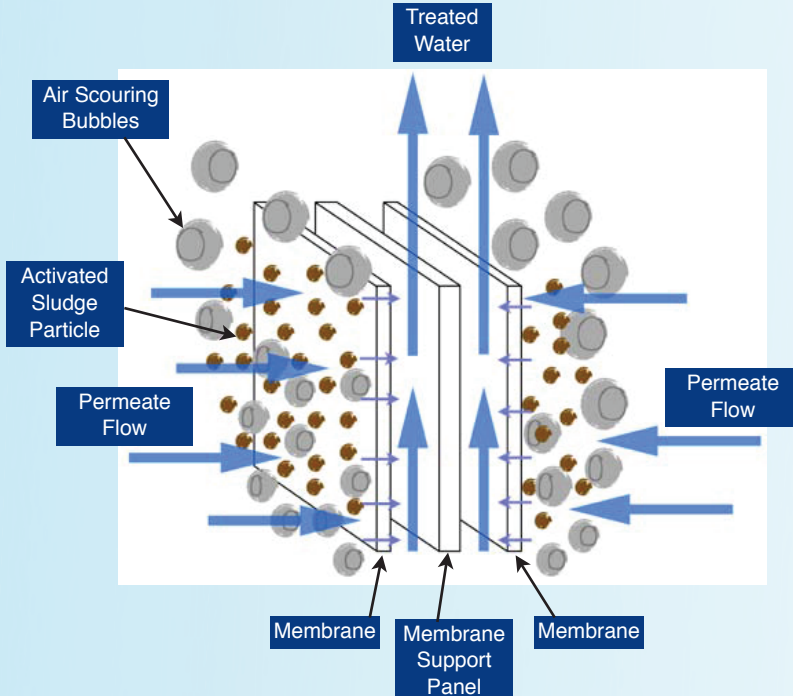
EFLO Water Treatment Products :

- EfloSAF** Submerged Aerated Filter
- EfloMBR** Membrane Bio-Reactor
- EfloDAF** Dissolved Air Floatation
- EfloGREY** Grey Water Re-Cycling
- EfloRO** Sea Water & Brackish Water Reverse Osmosis
- EfloSBR** Sequential Batch Reactor
- EfloCT** Extended Aeration
- EfloSEP** Oily Water Separator
- EfloCHEM** Water Treatment Chemicals
- EfloSLUDGE-DRY** Sludge Dewatering

EfloMBR

Membrane Bio Reactor

Membrane Principle

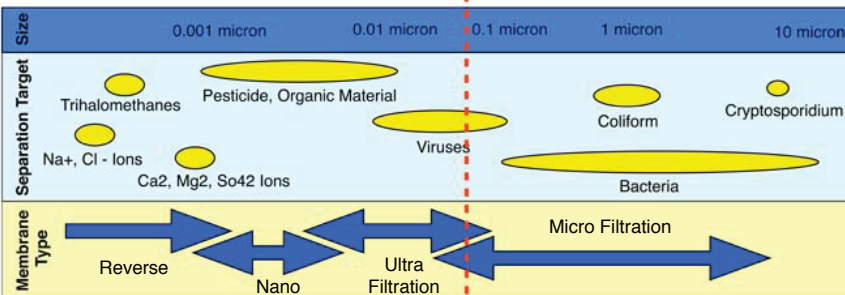


The diagram on the left shows the principle of operation at the membrane surface. The membranes used in the EfloMBR are the flat sheet type. The individual membranes are securely held within a stainless steel frame which is mounted above an air diffuser system, also in stainless steel.



Multiple membrane sheets are located within each frame and multiple frames are used in the MBR tanks. The treated water - or permeate - is drawn through the membranes by use of a suction pump and delivered to the treated water tank via a series of polyurethane tubes, header pipes and a ring main.

Membrane Types



The **EfloMBR** uses membranes at the ultra / micro filtration range. At this range many bacteria and some virus are rejected and not allowed to pass out with the treated water. This provides a significant level of disinfection in the treated water. Minimal or no chlorination is required in the treated water.

The treated water is therefore very suitable for many uses such as unrestricted irrigation, WC flushing or aquifer recharge. The treated water can be polished further to a potable quality by the employment of RO Reverse Osmosis membranes.



Evenly Distribution of MBR Tank Air Scouring Pattern above Membrane Frames. On left are the Air Diffuser Auto Purging Valves

Typical Example of Treated Water Quality.
Crystal Clear.
< 3 : < 2 : < 1
(BOD : TSS : NH3-N)



EfloMBR Operation, Maintenance and Reliability

The MBR is a very compact treatment plant that produces an exceptional quality of treated water by combining conventional treatment with ultra filtration technology.

Compared with conventional processes, the MBR with its advance in treated water quality has resulted in the inclusion of more expensive, technically advanced components and more complex control systems.

The membranes employed are filters and are operated at a specific flux rate. This means there is an absolute maximum design flow the MBR can be operated at. Unlike conventional process, the MBR cannot be hydraulically overloaded. Careful consideration must be given to the design inflow rate.

Peaks in daily inflow are usual and the **EfloMBR** accommodated these using the Eflo Constant Transfer process.

In order to protect the membranes, very carefully designed inlet works are provided, including fine screening, grit and fat-oil-grease (FOG) removal.

In spite of the fine inlet screens, Eflo also include these Biomass Screen to remove the build up of hair and fibre ragging in the mixed liquor. This is a constant problem in all MBR sewage treatment processes and causes severe fouling of the membranes, *irrespective* of the size of the inlet screens.

Removal of the hair and fibre maintains flux and minimises maintenance downtime, as well as increasing the working life of the membranes which is a huge cost benefit to the owner

The **EfloMBR** operates automatically under PLC. The smaller plants have a HMI touch screen on the control panel and the larger plants have dedicated control & operator rooms. The plants have extensive process instrumentation to monitor the critical components in order to ensure the membranes are operated under optimal conditions.

The information logged by this instrumentation provides the necessary data for the membrane cleaning programme. The **EfloMBR** uses clean in Place CIP for the membrane cleaning and uniquely, employees biomass screening to minimise or avoid the removal membrane frames for cleaning.

In all but the smallest **EfloMBR** plants, an Aeration and MBR tank is employed. This allows Eflo to use, energy efficient, fine bubble air diffusion for the biological oxidation.

The MBR tank employee medium bubble air diffusion for the air scouring required to prevent biomass fouling of the membrane sheets. These air diffusers are automatically reverse purged six times daily to prevent clogging.



Typical Control Room on Larger **EfloMBR** Plants



Typical View of **EfloMBR** Inlet Works, 6 + 3 mm Screens, FOG & Grit



EfloMBR 7,500 m³ per Day

EfloMBR

Membrane Bio Reactor

EfloMBR Packaged Containerised Plants and Concrete Tank Plants



EfloMBR 700 m3 per day packaged plant factory built and tested using epoxy coated steel tanks. Rapid delivery and start up.



EfloMBR 1000 m3 per day plant assembled on site using client's steel reinforced concrete tanks.

EfloMBR

Membrane Bio Reactor

EfloMBR Ancillary Equipment and Processes



Road tanker discharge facility. Facility includes four tanker discharge points with sealed suction hoses to prevent escape of odour. The odour is scrubbed clean by a Bio Scrubber followed by a polishing chemical scrubber. The discharge facility also has a 6 mm auto screen, a buffer tank and pumping station to deliver the waste water to the adjoining **EfloMBR**.

The Bio Scrubber is the primary odour control unit and saves on chemical usage over the conventional chemical scrubbers.

Typical Motor Control Centre for the larger **EfloMBR** treatment plants, containing PLCs, VFD motor controllers and main switchgear. Clean, air conditioned room complete with operator station with computer and monitors.



Blower Packages within acoustic enclosures delivering air to the Aeration Tank fine bubble air diffusers and the MBR Tank air scouring.

Roots type blowers coupled to VFD motors for slow start & stop as well as linking blower speed to aeration tank oxygen concentrations



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